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May 1982
vol 8, no 5
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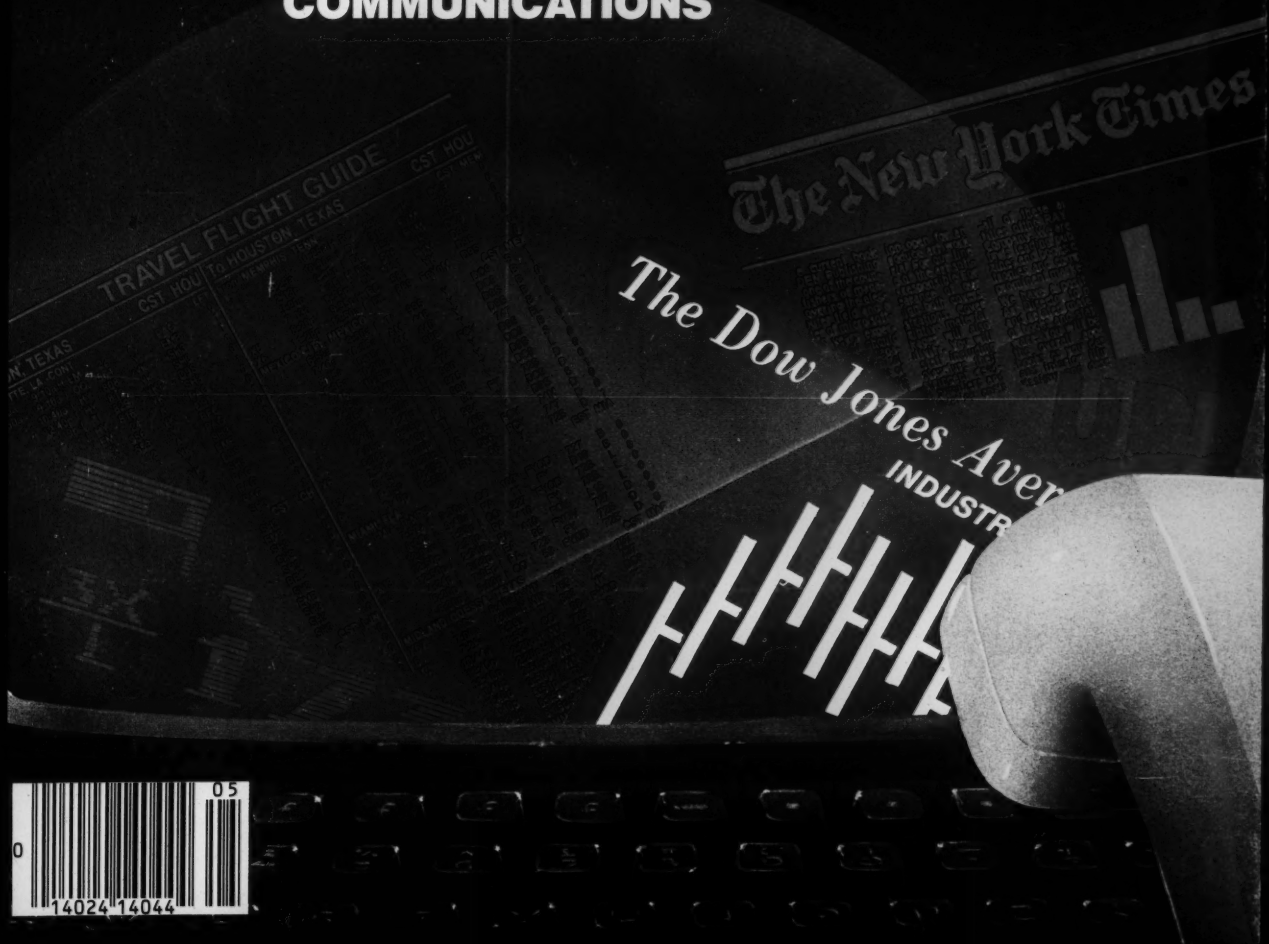

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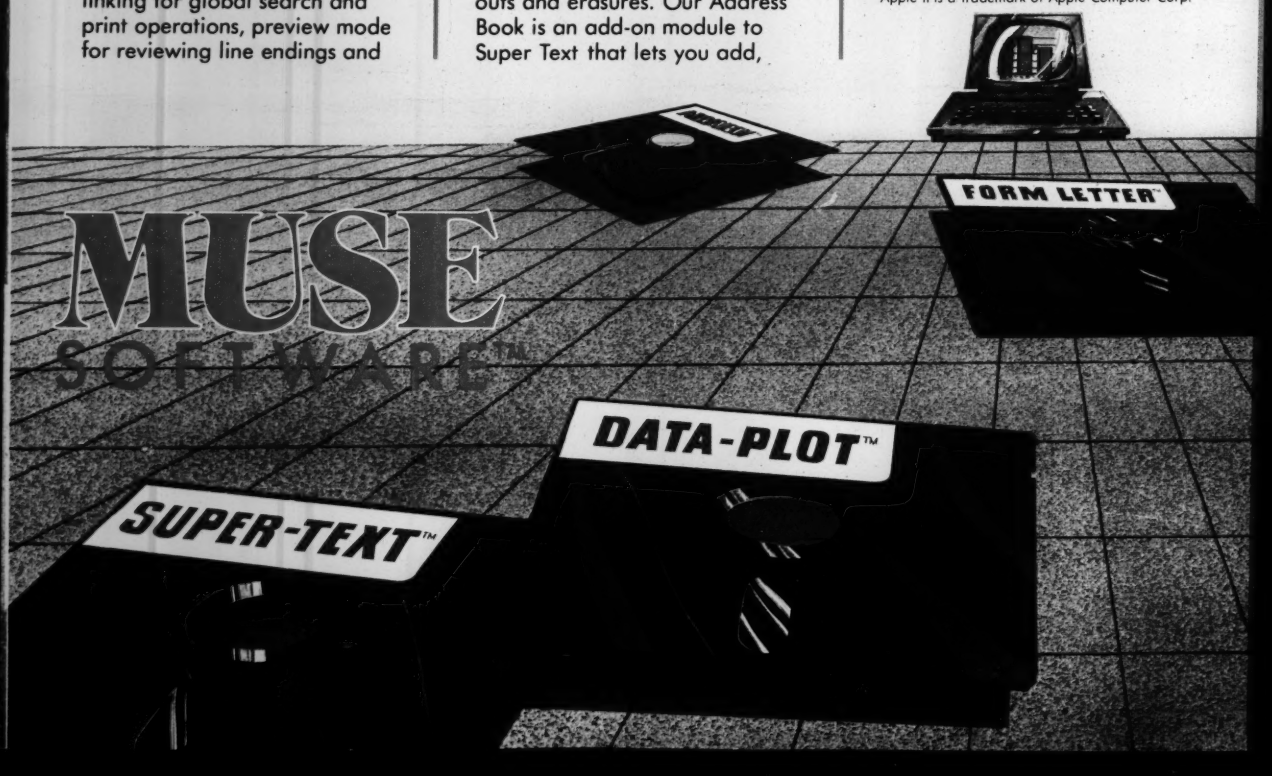

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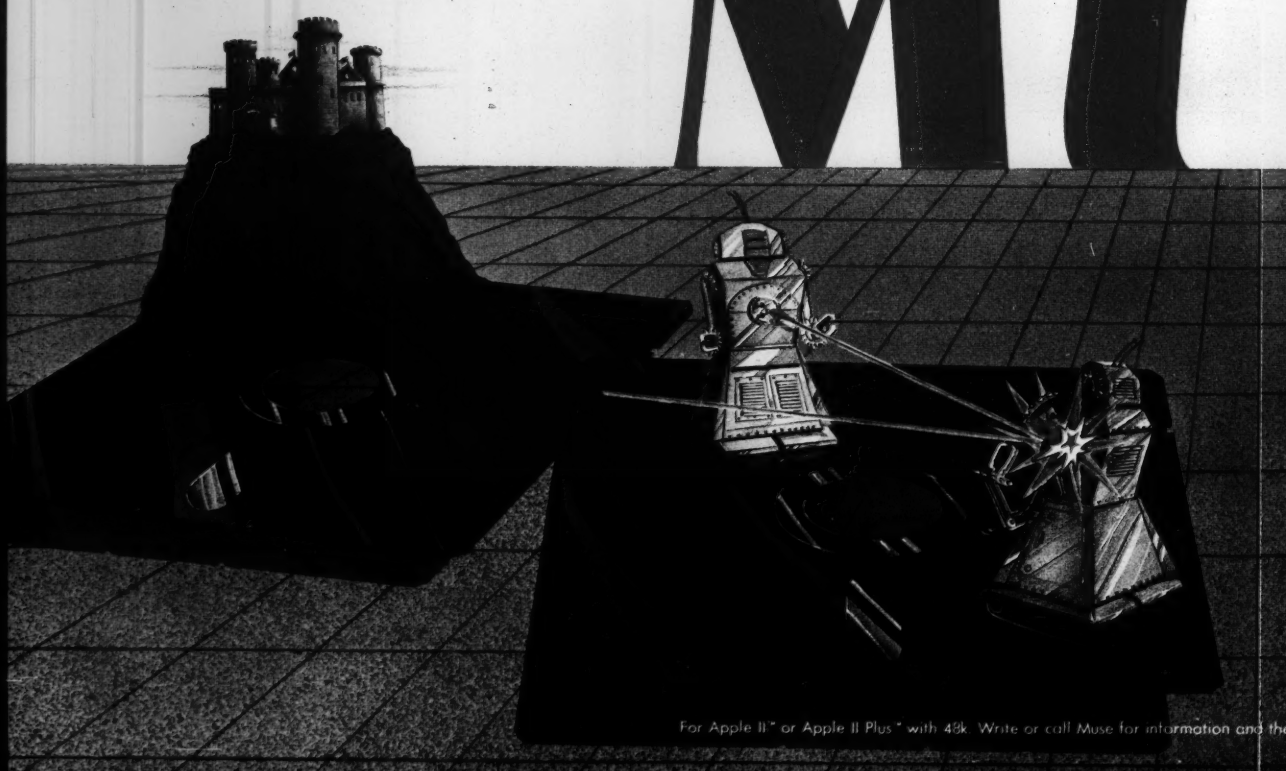

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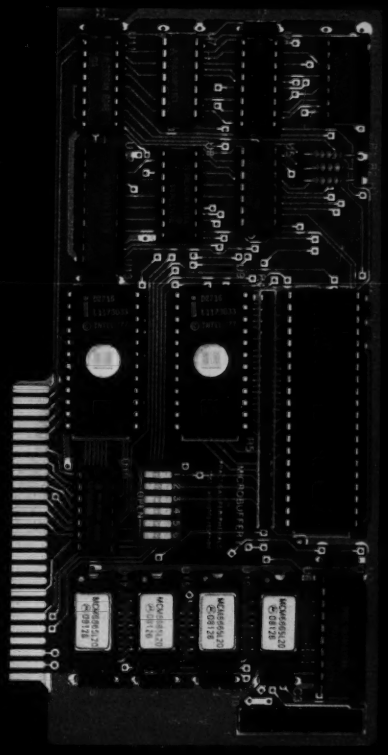

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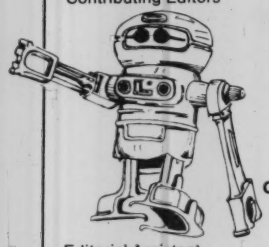

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CIRCLE 127 ON READER SERVICE CARD

utput...input/output...input

First You Line the Walls with Aluminum Foil...

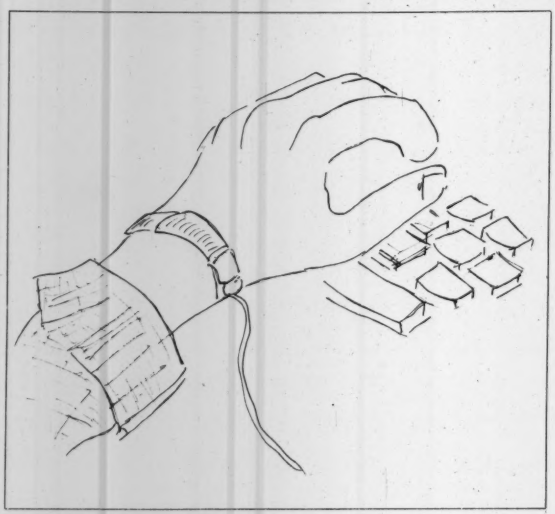
Dear Editor:

I saw a letter in *Creative Computing* in which the writer complained of "random reboot" and freeze-up in the TRS-80 Model I.

Please let me tell you what I have done to cure my system of freeze-ups and random reboots.

First, to eliminate the freeze-ups, you must eliminate static electricity. My Model I is so sensitive that it would freeze up if I even came near it and did not touch it. I use a stainless steel automobile radiator clamp, snug on my wrist, with a long wire attached to ground. Since I started to use it I have had no freeze-ups at all. I have a simple connector on the wire so I can get unhooked in a hurry to go to the next room or whatever, and I make sure I re-connect before I touch the equipment.

Second, I have installed gold-plated edge connectors. They have totally eliminated the re-boot problem: no more oxidized connectors. They are called Goldplug-80 and are sold by the EAP Co., Box 14, Keller, TX. You must dismantle your keyboard and interface to solder them on, but it is a simple job and takes about an hour.



This may sound drastic, but it beats replacing your equipment to solve a frustrating problem. As an alternative, you could try to brush-plate your contacts, but you would still have to take everything apart, and risk corrosion and/or electrical damage as well.

Richard A. Press, M.D.
493 American Drive
Yardley, PA 19067

Spraying for Keeps

Dear Editor:

Robin Ault's letter in Input/Output concerning reinking printer ribbons is the reason for this letter. If you don't want to go to the hassle of making up a reinking device you can just apply a little WD-40 (sold in most auto supply and hardware stores) to an old ribbon. The stuff gets the old ink mobile and redistributes it. Ribbons last about three times normal life with the WD-40 treatment.

Here's the technique I use. First I get the ribbon in motion. To do this I use the program:

```
10 PRINT " ";:GOTO 10
```

I then apply the WD-40 with a small paint brush or section of stamp pad. Get the ribbon wet but not soaking wet. OK, now let it dry for about half an hour.

Mr. Ault's system is much better than the WD-40 system but requires more time and effort. By the way, WD-40 also works on typewriter ribbons. Just give the ribbon spools a good shot of the stuff. The ribbon I'm using is in its third life now and is getting ready for its fourth. I suspect that any penetrating oil would work as well as WD-40.

George Trepal
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Bar Sinister

Dear Editor:

Undoubtedly the editorial staff of *Creative Computing* has considered the following question, but many of us readers would appreciate your response to, "Could *Creative Computing* print its programs in bar code as well as typed form?"

The obvious reason for my question is my poor typing speed and accuracy. (I don't think that I'm your only reader with this problem!) Bar code readers that would pick up bar code and transmit it to one's micro are now available for about $150. Programs in code would not only save typing hours—and searching-for-typing-errors hours—but also make it possible for more of us to attempt those long programs that now just look plain discouraging; not because the programs aren't tantalizing but because typing hundreds of error-free lines is so tedious. We could be up and running them in minutes instead of many hours if we had bar coded programs.

If some of the problems associated with this suggestion involve cost to you in terms of capital equipment and personnel as well as more pages per magazine issue, perhaps this added expense could be handled as some scientific journals do it. They charge an extra fee for pages of lengthy data and you have to pay for each article you want. Alternately, an outside repository or "clearing house" has the data and you send a check to them for the data pages. *Creative Computing* bar coded programs could be handled the same way as an extra cost feature by you or a "translation clearing house."

Frank L. Lambert

As a technology, bar code is suitable only for small discrete units of information, such as the universal product code on the cover of this magazine, or short programs for a programmable calculator. It takes up too much space to justify its use as a medium for publishing programs. The major element in software publishing is not direct media cost (15 cents each for a few hundred bar code listings, 50 cents for a cassette, $2 for a diskette). At least half of the cost of any published piece of software is the marketing cost, finding a customer. Usually about one third of the cost pays for creating the product and preparing it for publication. Publishing on bar code would decrease the media cost, but increase the marketing cost significantly, as few people have bar code readers, and most are eager to have the convenience of other media. Should we save $1.85 putting a program on paper instead of a diskette so that a customer can use a $150 device to put it on a diskette that probably cost him $5?—GB

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Seeing is believing. See the SoftCard in operation at your Microsoft or Apple dealer. We think you'll agree that the SoftCard turns your Apple into the world's most versatile personal computer.

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CIRCLE 177 ON READER SERVICE CARD

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Where's Ralph Nader When We Need Him?

Dear Editor:

Isn't it time that our industry grew up? I just resisted purchasing an expensive piece of computer software for which the warranty reads in part:

"All...computer programs are distributed on an "as is" basis without warranty of any kind. The entire risk as to the quality and performance of such programs is with the purchaser. Should the programs prove defective...the purchaser and not the manufacturer...assumes the entire cost of all necessary servicing or repair. (The company) shall have no liability or responsibility to a purchaser...."

This is not mere legal jargon. It's the embodiment of a business philosophy which seriously harms all of us. It encourages sloppy work and inadequate testing; it even increases the potential for dishonesty. Whatever justification there might have been in our infancy of freely exchanged software, it certainly does not apply to today's expensive copy-protected or ROMed software, for which the source code is generally unavailable. It is any wonder that so many businessmen are "turned off" by computers?

To software companies I say: Accept responsibility for your products. Get the bugs out *before* you sell them. Don't try to sell a program debugged by your customers as a "revised" or "improved" product at additional cost.

To software consumers I say: If possible, avoid products for which there is no warranty. Don't buy on faith. Complain loudly to software companies which provide no warranty.

Of *Creative Computing* I ask: Speak out on the importance of hardware and software warranties. Help your readers by reporting on the warranty provided in all product reviews. Praise the responsible firms that produce quality products and help to expose the ones with a reputation for bugs.

John Navas II
490 Mariners Island Blvd., #108
San Mateo, CA 94404

Unfortunately, the better a product is, the more likely it is to have a warranty disclaimer. The reason is that the companies which can afford to do a thorough job of preparing software for market are large enough to have found that legal assistance is essential to survival in a world of constant litigation. Very few companies can afford to guarantee programs against consequential damages. If IBM were to go broke because they were foolish enough to use a floppy disk based microcomputer for corporate accounting, it is not the fault of a programmer who designed an accounting system for a lemonade stand. (They probably should, however, sue the salesman who told them it was just what they needed.) The lawyer is not interested in the customer; he is paid to protect the company. While warranties do tell you what you can expect in court, there is often a significant difference between what a company guarantees and their actual service. I am annoyed by disclaimers myself, but generally try to discover whether the company stands behind the product or hides behind the disclaimer before I make up my mind. —GB

Don't Log It In

Dear Editor:

In the February 1982 I/O column Robert Lehrburger posed a problem he was having in testing a floating point number for equality.

Most computers, including the Apple, will perform exact arithmetic for small integers and simple arithmetic functions. However, when squaring a number, Mr. Lehrburger used the exponent function. Exponentiation is performed by taking the log of the number, multiplying it by the exponent, and taking the antilog of the answer.

Because of the computation error in the log function the answer will generally not be an integer even if the original number and the exponent were integers.

I suggest that if Line 67, $P=Q^2$, is replaced by P=Q*Q, the program will give the expected result.

Herb Hope
19804 Ridge Manor Way
Yorba Linda, CA 92686

Catalog Command

Dear Editor:

I was shocked at your article "IBM + Sears Doesn't Compute" in the February 1982 issue. I recently purchased a new IBM Personal Computer from the Preston Court Sears Business Systems Center in Dallas, TX.

I walked in Saturday afternoon, filled out a credit request form and picked up my system about a week later. Some of this time was due to the unusual weather that had things shut down. The people at the center were most helpful and checked out the system fully before delivery.

R. Diddle
5930 Arapaho #1138
Dallas, TX 75248

We're glad your experience was better than ours. Our system finally did arrive, and has been working very nicely. —EBS

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Software Prize for Best Question

Starting in July, *Creative Computing* will run a series of in-depth articles covering hi-res graphics and animation on the Apple II Plus computer.

The series will begin with elementary concepts such as Applesoft graphics commands, but will also cover a full range of machine-language techniques including integration of animation with sound and methods for developing complete programs.

To insure that the articles meet your needs we are interested in receiving questions on *any* area of graphics. Whether your question is on basic concepts or advanced areas, please let us hear from you.

While we can't respond to each individual letter, as many questions as possible will be answered in the articles.

As an added incentive, the person who sends in the best question covered in each month's article will receive a copy of *Shape Master* from Creative Computing Software.

Address all letters to The Graph Paper, Creative Computing, 39 E. Hanover Ave., Morris Plains, NJ 07950. Please specify whether or not you wish to have your name appear in print with your question.

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NECC-82

The 1982 National Educational Computing Conference (NECC-82) will be held in Kansas City, MO, June 28-30, 1982. The purpose of the conference is to provide a forum for discussion among individuals interested in educational computing.

For additional information, please contact: E. Michael Staman, NECC-82 General Chairman, Campus Computing Services, University of Missouri-Columbia, 305 Jesse Hall, Columbia, MO 65211.

Summer Computer Simulation Conference

The 1982 Summer Computer Simulation Conference will be held July 19-21, 1982 at the Marriott City Center Hotel in Denver, Colorado.

The SCSC covers all aspects of simulation methodology and applications. Technical Sessions include presentations on mathematical methods, model design, simulation languages, validation techniques and the use of a variety of equipment and processor configurations.

For more information, contact: Lawrence Sashkin, The Aerospace Corporation, P.O. Box 92957, Los Angeles, CA 90009.

Corrections

The following line was omitted from the program for "Player/Missile Design Aid." (February 1982, page 168.)

```
1070 POSITION K27,K10:? C$;A$;:
POSITION K27, 11:? C$;L$;:POSITION
K27,K12:? C$;"Column";:LX=0: LY=0:
X=0:Y=0
```

Due to a production error, the Book Reviews Section of our April 1982 issue (page 252) omitted the name of the book to which Glenn Kleiman gave such an excellent review. For the curious, that book is **The Electronic Cottage** by Joseph Deken. It is available from William Morrow and Company, Inc., of New York for $14.95.

IBM's new baby just grew up.

SEATTLE COMPUTER'S NEW RAM+ GIVES YOU THE MEMORY YOU NEED AT A PRICE YOU CAN'T FORGET.

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RAM+ can change your personal IBM from a pony to a workhorse by adding up to 256 K of memory. RAM+ is expandable, reliable and is made by Seattle Computer, the people who created the operating system for the IBM personal computer.

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The RAM+ —a great addition to your IBM personal computer. At a great price.

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An Embarrassment of Riches

Few people would consider it a problem, but the *Creative Computing* editorial staff is about to sink beneath an ocean of new software and peripherals.

You see, manufacturers know that *Creative Computing* publishes fair, in-depth evaluations of new products. They know that we want to be first with reviews of state-of-the-art hardware and software. So they send us games, educational packages, investment programs, computers, printers, terminals, music synthesizers, electronic toys—every kind of computer-related product you can think of.

Of course, we appreciate their enthusiasm, and we want to keep you up-to-date on the newest products, but we can't do it all in-house. We need your help.

If you have a computer system, writing ability, an open mind, and few spare hours, you could become a reviewer for *Creative Computing*. You won't make a fortune (we pay about $50 per printed page), but you may make a name for yourself.

If you would like to share in our riches, please write and answer the following questions (If you have more than one computer, list the information for each one separately.):

1. What type of computer do you have and how much memory does it have?
2. Do you have a disk drive? (Most software sent for review is on disk.)
3. Do you have a printer? What kind?
4. What other peripherals do you have?
5. What peripherals would you like to have?
6. Do you use any kind of network (The Source, CompuServe, Prestel, etc.)?
7. What do you use your computer for (business, education, word processing, adventure games, recipe conversion, etc.)?
8. Do you have any other areas of interest in the personal computing field?
9. Would you prefer to evaluate hardware or software?
10. What else should we know about you and/or your computer?

Please don't forget to include your name and address and a telephone number at which we can contact you during the day.

We have quite a few new products on hand at the moment and will begin to distribute them to appropriate reviewers as soon as we find out who you are. In general, products must be returned to us or to the manufacturer, however, when possible, we will let you keep the item.

Write to: Editor, Creative Computing, 39 E. Hanover Ave., Morris Plains, NJ 07950. □

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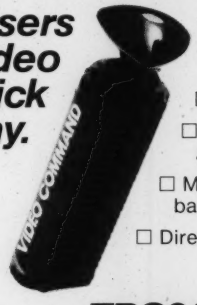

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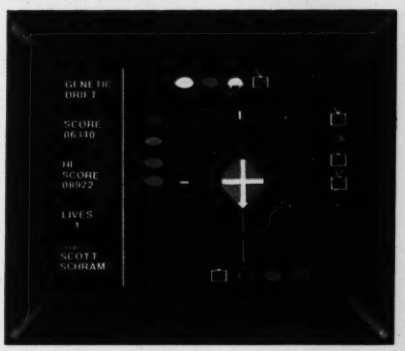

This finger-pounding arcade game requires

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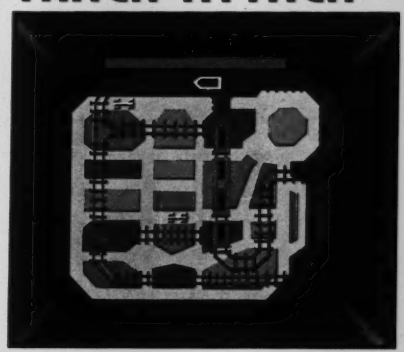

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Introducing the Sinclair ZX81

If you're ever going to buy a personal computer, now is the time to do it.

The new Sinclair ZX81 is the most powerful, yet easy-to-use computer ever offered for anywhere near the price: only $149.95* completely assembled.

Don't let the price fool you. The ZX81 has just about everything you could ask for in a personal computer.

A breakthrough in personal computers

The ZX81 is a major advance over the original Sinclair ZX80—the world's largest selling personal computer and the first for under $200.

In fact, the ZX81's new 8K Extended BASIC offers features found only on computers costing two or three times as much.

Just look at what you get:

- Continuous display, including moving graphics
- Multi-dimensional string and numerical arrays
- Mathematical and scientific functions accurate to 8 decimal places
- Unique one-touch entry of key words like PRINT, RUN and LIST
- Automatic syntax error detection and easy editing
- Randomize function useful for both games and serious applications
- Built-in interface for ZX Printer
- 1K of memory expandable to 16K

The ZX81 is also very convenient to use. It hooks up to any television set to produce a clear 32-column by 24-line display. And you can use a regular cassette recorder to store and recall programs by name.

*Plus shipping and handling. Price includes connectors for TV and cassette, AC adaptor, and FREE manual.

If you already own a ZX80

The 8K Extended BASIC chip used in the ZX81 is available as a plug-in replacement for your ZX80 for only $39.95, plus shipping and handling—complete with new keyboard overlay and the ZX81 manual.

So in just a few minutes, with no special skills or tools required, you can upgrade your ZX80 to have all the powerful features of the ZX81. (You'll have everything except continuous display, but you can still use the PAUSE and SCROLL commands to get moving graphics.)

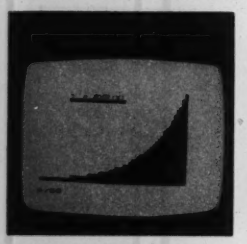
With the 8K BASIC chip, your ZX80 will also be equipped to use the ZX Printer and Sinclair software.

Order at no risk**

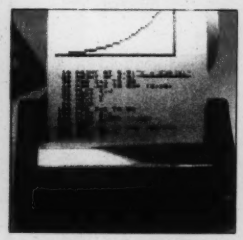
We'll give you 10 days to try out the ZX81. If you're not completely satisfied, just return it to Sinclair Research and we'll give you a full refund.

And if you have a problem with your ZX81, send it to Sinclair Research within 90 days and we'll repair or replace it at no charge.

**Does not apply to ZX81 kits.



NEW SOFTWARE: Sinclair has published pre-recorded programs on cassettes for your ZX81, or ZX80 with 8K BASIC. We're constantly coming out with new programs, so we'll send you our latest software catalog with your computer.



ZX PRINTER: The Sinclair ZX Printer will work with your ZX81, or ZX80 with 8K BASIC. It will be available in the near future and will cost less than $100.

16K MEMORY MODULE: Like any powerful, full fledged computer, the ZX81 is expandable. Sinclair's 16K memory module plugs right onto the back of your ZX81 (or ZX80, with or without 8K BASIC). Cost is $99.95, plus shipping and handling.

ZX81 MANUAL: The ZX81 comes with a comprehensive 164-page programming guide and operating manual designed for both beginners and experienced computer users. A $10.95 value, it's yours free with the ZX81.

The $99.95 personal computer.

Introducing the ZX81 kit

If you really want to save money, and you enjoy building electronic kits, you can order the ZX81 in kit form for the incredible price of just $99.95* It's the same, full-featured computer, only you put it together yourself. We'll send complete, easy-to-follow instructions on how you can assemble your ZX81 in just a few hours. All you have to supply is the soldering iron.

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CALL 800-543-3000. Ask for operator #509. In Ohio call 800-582-1364. In Canada call 513-729-4300. Ask for operator #509. Phones open 24 hours a day, 7 days a week. Have your MasterCard or VISA ready.

These numbers are for orders only. For information, you must write to Sinclair Research Ltd., 2 Sinclair Plaza, Nashua, NH 03061.

sinclair

AD CODE 05CC	PRICE†	QTY.	AMOUNT
ZX81	$149.95		
ZX81 Kit	99.95		
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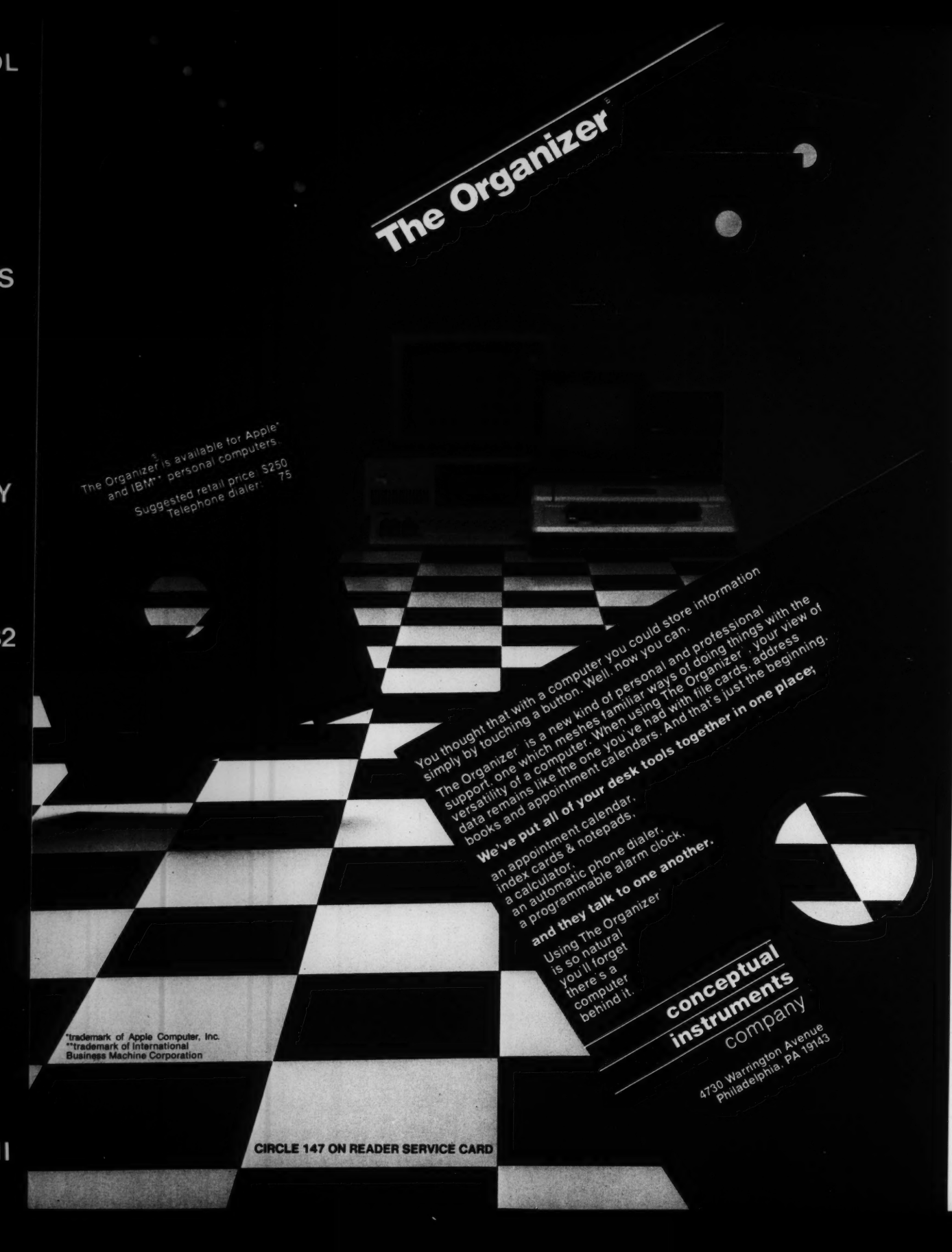

The Organizer® is available for Apple* and IBM** personal computers.

Suggested retail price: $250
Telephone dialer: 75

You thought that with a computer you could store information simply by touching a button. Well, now you can.

The Organizer® is a new kind of personal and professional support, one which meshes familiar ways of doing things with the versatility of a computer. When using The Organizer®, your view of data remains like the one you've had with file cards, address books and appointment calendars. And that's just the beginning.

We've put all of your desk tools together in one place;

an appointment calendar,
index cards & notepads,
a calculator,
an automatic phone dialer,
a programmable alarm clock,

and they talk to one another.

Using The Organizer® is so natural you'll forget there's a computer behind it.

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CIRCLE 147 ON READER SERVICE CARD

creative computing software evaluation

The TRS-80 as Smart Terminal

creative computing
SOFTWARE PROFILE

Name: Omniterm
Type: Communications
System: 32K TRS-80, Disk Drive
Format: Disk
Language: Machine
Summary: Turns the TRS-80 into a smart terminal.
Price: $95
Manufacturer:
Lindbergh Systems
41 Fairhill Road
Holden, MA 01520

Omniterm is a program that converts Model I and III TRS-80 computers into "smart" terminals; or to be more precise, into "super smart" terminals. Requiring only 32K of RAM and one disk drive, *Omniterm* gives the personal computer user many of the advantages and features available on giant mainframe computers.

Just as a start, consider this. You have a TRS-80 and your friend has a Zenith/Heathkit H89. Your chances of swapping programs other than by typing in a listing are nil. Yet with *Omniterm* and a modem at each computer, you can swap programs over the telephone line, actually feeding the electrical signals of one computer into the other.

Herb Friedman, Tridac Electronics Corp., 588 Hewlett Street, Franklin Square, NY 11010.

Herb Friedman

What's that? You say there are differences in Basic that prevent a direct swap? Not so. *Omniterm* has an in/out editor, and a translator that straightens out standard ASCII, which really isn't all that standard. In fact, only one location needs *Omniterm* because *Omniterm* can make the translations both ways. You can use the editor on incoming and outgoing signals to ensure that they match the computer(s).

A smart terminal allows you to use your computer as a computer even when it is working as a terminal.

For those of you completely lost in all these new terms and phrases, let's go back to the beginning and explain "smart" and "dumb" terminals.

The common form of terminal with which most computer users are familiar is the TTY (teletypewriter) arrangement consisting of a keyboard—called the "transmitter" or "sender,"—and a display—the receiver—that provides either a hard copy printout or a CRT display. The keyboard and display are two separate entities. They are rarely connected in normal use although some form of interconnect is provided to check out the complete terminal.

Typing on the keyboard produces a local display. Normally, the terminal connects to a local computer or to a remote computer via a modem and telephone line. The remote can be a time-share or a personal computer.

The information typed on the keyboard is fed to the computer. What is seen on the display is actually an echo provided by the computer, which is fed back to the display so the user can check the information he has entered on the keyboard.

Smart and Dumb Terminals

All the terminal can do is send and receive characters. It's not very bright; so it's called a "dumb" terminal.

When you purchase the Radio Shack serial interface you also get a program that allows your TRS-80—complete with all its memory and disk drives—to function as a dumb terminal. You can use it to converse with other terminals over the telephone lines (through modems), or even to talk to a time sharing system or community bulletin board. But that's all it can do. Your personal computer remains a dumb terminal, with all its memory and data storage going to waste. All you can do is read what is sent out from the other end.

On the other hand, a *smart terminal* allows you to use your computer as a computer even when it is working as a terminal. It will store information coming down the line, can transmit directly from memory, and it should be able to do some of the things your computer normally can do in conjunction with the terminal mode. At its best it should also throw in every feature you think you might ever need, and a few you haven't even thought of.

Most of the smart terminal software available for the TRS-80 falls in the first category—you get a few computer functions. Then there is *Omniterm*, which doesn't just make your computer smart, it makes it 'a genius'—an expanded computer terminal system capable of just about anything.

Omniterm is a package consisting of 15 disk programs including Basic, standard Backup (for single drive systems) and the TRSDOS 2.3 operating system. In addition to *Omniterm* itself, there are special operating modes for MicroNet and The Source, ASCII to binary conversion (and vice versa) and translation, which we'll get to later.

Using the Program

When *Omniterm* is loaded, it converts the TRS-80 into a smart terminal. A complete menu is displayed when the "@" key is pressed twice. The menu shows all the operating modes, the terminal conditions, total available buffer RAM and the amount used. Pressing a key directly enters the command without a Return. It is also easy to change the terminal conditions as shown in Figures 1-3.

Figure 1.

```
          OMNITERM Command Mode  -  Hit <BREAK> to quit

  P  PRINTER              is:  OFF      X  SYSTEM COMMANDS
  R  SCREEN REFORMATING   is:   54      T  CHANGE/EXAMINE TABLES
  C  CR SUPPRESSION       is:  OFF      U  CHANGE UART SETTINGS
  L  LF SUPPRESSION       is:   ON      A  SEND CONTROL-A & QUIT
  D  DUPLEX               is: FULL      @  SEND "AT" SYMBOL & QUIT
  E  ECHO                 is:  OFF      B  SCROLL BACK DISPLAY
  G  CR/LF GROUPING       is:  OFF      Z  ZERO REAL TIME CLOCK
  I  INPUT TO BUFFER      is:  OFF      F  FILL BUFFER FROM DISK
  O  OUTPUT FROM BUFFER   is:  OFF      S  SAVE BUFFER TO DISK

  Baud Rate =   300                     Parity Errors :     0
  Data Bits =     7                     Framing Errors:     0
  Stop Bits =     1                     Overrun Errors:     0
  Parity    =  EVEN                     Buffer:     0 of  9358 used
```

Figure 2.

```
          OMNITERM Command Mode  -  Hit <BREAK> to quit

  P  PRINTER              is:  OFF      X  SYSTEM COMMANDS
  R  SCREEN REFORMATING   is:   54      T  CHANGE/EXAMINE TABLES
  C  CR SUPPRESSION       is:  OFF      U  CHANGE UART SETTINGS
  L  LF SUPPRESSION       is:   ON      A  SEND CONTROL-A & QUIT
  D  DUPLEX               is: FULL      @  SEND "AT" SYMBOL & QUIT
  E  ECHO                 is:  OFF      B  SCROLL BACK DISPLAY
  G  CR/LF GROUPING       is:  OFF      Z  ZERO REAL TIME CLOCK
  I  INPUT TO BUFFER      is:  OFF      F  FILL BUFFER FROM DISK
  O  OUTPUT FROM BUFFER   is:  OFF      S  SAVE BUFFER TO DISK

  Baud Rate =   300                     Baud Rate = 110
  Data Bits =     7                     Data Bits =
  Stop Bits =     1                     Stop Bits = 2
  Parity    =  EVEN                     Parity (E,O,N) = O
```

Figure 3.

```
          OMNITERM Command Mode  -  Hit <BREAK> to quit

  P  PRINTER              is:  OFF      X  SYSTEM COMMANDS
  R  SCREEN REFORMATING   is:   54      T  CHANGE/EXAMINE TABLES
  C  CR SUPPRESSION       is:  OFF      U  CHANGE UART SETTINGS
  L  LF SUPPRESSION       is:   ON      A  SEND CONTROL-A & QUIT
  D  DUPLEX               is: FULL      @  SEND "AT" SYMBOL & QUIT
  E  ECHO                 is:  OFF      B  SCROLL BACK DISPLAY
  G  CR/LF GROUPING       is:  OFF      Z  ZERO REAL TIME CLOCK
  I  INPUT TO BUFFER      is:  OFF      F  FILL BUFFER FROM DISK
  O  OUTPUT FROM BUFFER   is:  OFF      S  SAVE BUFFER TO DISK

  Baud Rate =   110                     Parity Errors :     0
  Data Bits =     7                     Framing Errors:     0
  Stop Bits =     2                     Overrun Errors:     0
  Parity    =  NONE                     Buffer:     0 of  9358 used
```

For example, our version comes up at 300 baud, with 7 data bits, 1 stop bit, and even parity. The personal computer user we are talking to has a teletype terminal so we must configure for him. First, we press the U (change UART), then we enter the new parameters—which are displayed at the bottom right of the screen. Press Return, and the screen clears and displays our new terminal parameters, which are 110 baud, 2 stop bits, and no parity (parity off). (It is possible to save these terminal parameters until the next time a change is needed.)

Pressing a key while in the command mode (menu displayed) instantly changes the mode to the opposite of what is displayed on the screen. Pressing the P will cause the screen to indicate that the printer is on. The next time the P is pressed the printer turns off.

You can edit your programs into the Basic (or protocols) of the receiving computer before they are transmitted.

The command functions are virtually self-explanatory. CR SUPPRESSION, CR/LF GROUPING, etc., simply turn the auto line feeds and carriage returns on and off to accommodate different printers and operating modes.

For example, Radio Shack printers don't use a linefeed: it's automatically provided by the printer. Try to use a different printer, however and everything will overprint on the same line. The LF and CR commands simply straighten out the mess Radio Shack has designed into their system.

ECHO is very convenient for the person with whom you are communicating. If your computer is talking to a timesharing system, you have no problems. But what if you are hooked up to another small computer? There is no way your friend can tell if his signals are getting into your computer. But if the ECHO is turned on, your computer transmits back down the line whatever it has received, just as if it were the time sharing host computer.

SCREEN REFORMATTING does just what it says; it configures your screen line length to match your printer.

The input and output buffer commands allow you to exchange programs or data through a modem or a direct connection to another computer.

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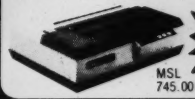

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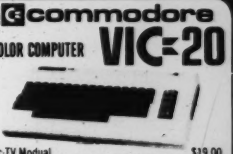

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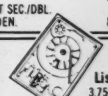

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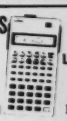

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feed a program to another computer. You load a disk file into the buffer through the input mode using command "F" (FILL BUFFER FROM DISK). Then you set the buffer for output. The instant you press the O key, the buffer is transmitted from the terminal. If you want to receive a program, you set the buffer for input, which loads whatever is received. Then you use the S (SAVE BUFFER TO DISK) command, which will ask for a standard TRS DOS filespec and then save to disk.

If you are connected to another TRS-80 computer you can exchange programs using the direct binary information from the TRS-80 disk or memory. But if the computer at the other end isn't a TRS-80 it will not be able to read data. In this case, the data or information exchange must be in ASCII. *Omniterm* provides the conversion programs—from ASCII to binary and vice versa—in the software package.

A built-in editor, TEXTED/BAS, allows you to edit input and output data. Assume you are swapping programs with a Zenith computer. Your Basics are similar, but not exactly the same. A wrong command here or there can cause the program to bomb. With *Omniterm* you can receive the Zenith program, edit it to remove or change unfamiliar Basic statements or commands, and then save a usable version.

Similarly, you can edit your programs into the Basic (or protocols) of the receiving computer before they are transmitted. (We have even connected a Zenith/Heathkit H89 computer directly to our TRS-80 in order to swap programs, which normally can't be done because, among other things, the disks are not compatible.)

Omniterm's translation feature is really what makes the terminal "super intelligent." One of the problems in using terminals is there is really no such thing as standard ASCII.

Worse, still, are the unmodified IBM terminal/printers which use IBM EBCDIC code rather than ASCII, which causes the IBM printer to create garbage from straight ASCII input.

Omniterm solves this problem by providing user programmable translation tables for every individual operating mode. For example, you can translate only the printer output to convert ASCII to EBCDIC for an IBM printer.

In Conclusion

We have only touched the highlights of *Omniterm*. Suffice it to say that we consider *Omniterm* among the very finest, if not the finest smart terminal program for the TRS-80.

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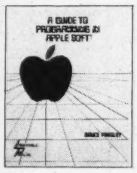

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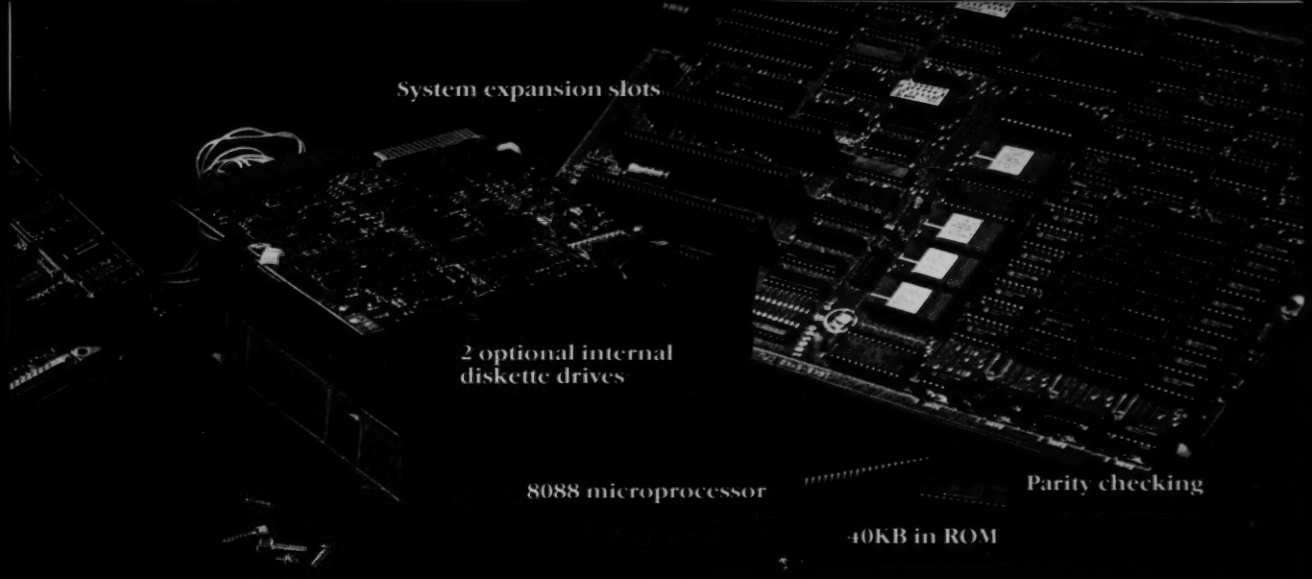

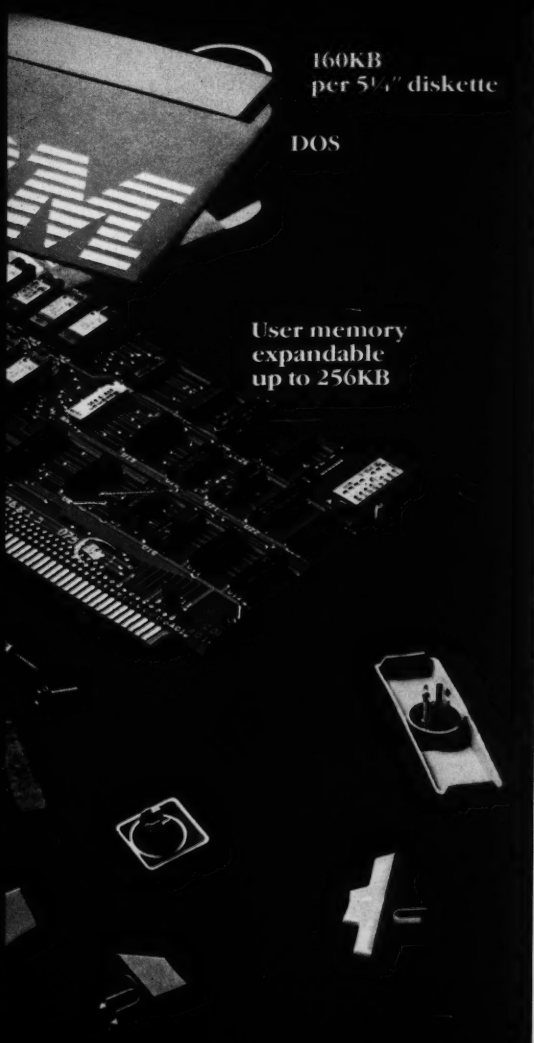

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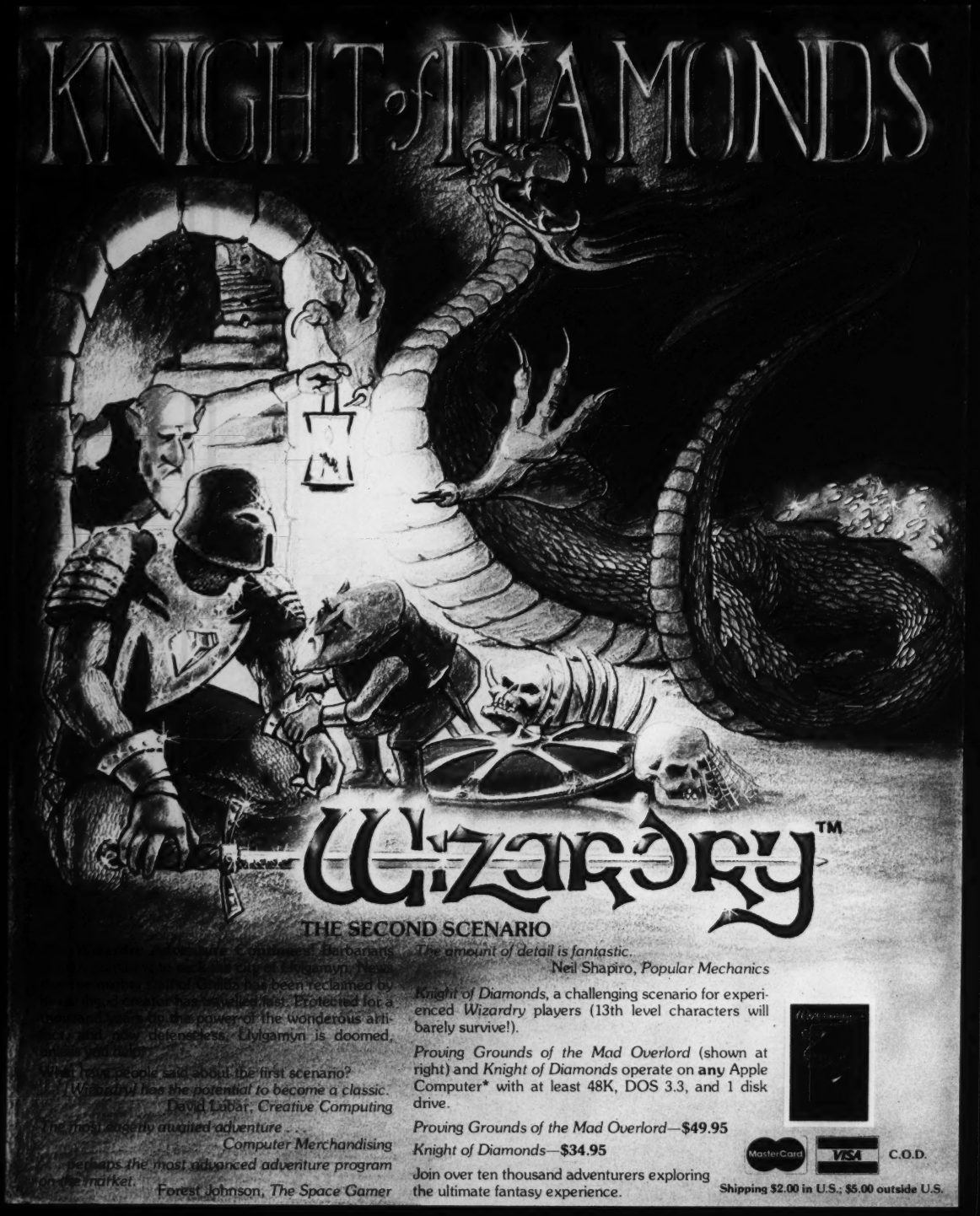

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CIRCLE 236 ON READER SERVICE CARD

Terminal Communications for the Apple

Ken R. Hancock

As this issue went to press, we received word that Personal Software Inc., "as part of a series of marketing actions to increase its corporate visibility" has changed its name to VisiCorp. VisiCorp was chosen as the new name "because it clearly identified the company with its VisiCalc program."

In future articles we shall call them by their new name; in this one we'll rely on you to substitute VisiCorp for each mention of Personal Software.—EBS

VisiTerm is a terminal communications program that was written by Tom Keith of Personal Software. It is a member of a popular series of Apple programs which includes VisiCalc, as well as VisiDex, VisiTrend/VisiPlot, Desk Top Plan and CCA Data Base Management.

All of these programs can save their data in a standardized form which Personal Software calls the Data Interchange Format. Thus, data developed using one program can be shared by the others. This feature greatly increases the usefulness of the series.

Documentation

The documentation consists of three separate pieces; the manual, the VisiTerm Pocket Reference card and the Personal Software User Assurance Plan card.

The manual is a professionally prepared document which comes in a three-ring binder. It is written by Jeffrey Emmet Levinger.

The manual, which is 100 pages long and features numerous photographs and drawings, is divided into the following parts: Table of contents, Preface, Introduction, VisiTerm Tutorial (three separate lessons), Reference, Appendices (eight in total), Glossary, and Index.

Most of the manual is written for the first time user and as a result may seem too wordy for the seasoned communications veteran. However, this is preferable to a manual that is lacking in critical explanation.

The VisiTerm Pocket Reference card is, when folded out, about four square feet of tables, photographs and abbreviated definitions of the numerous VisiTerm commands. It is divided into the four separate modes of VisiTerm operation: terminal mode, macro definition mode, options mode and file transfer mode. If you are considering the purchase of this program I would recommend that you take a look at the card first, it certainly is the best capsule of VisiTerm information.

creative computing

SOFTWARE PROFILE

Name: VisiTerm

Type: Communications

System: Apple II or II+, 8K Memory, 1 Disk Drive

Format: Disk

Language: Applesoft

Summary: Superb

Price: $100

Manufacturer:

VisiCorp
2895 Zanker Rd.
San Jose, CA 95134

The Personal Software User Assurance Plan is a card containing the warranty registration, backup diskette order card and a replacement disk order card. VisiTerm is a copy-protected disk and only one copy of the program is supplied with the package. The backup disk costs $30.

Although VisiTerm is copy-protected, the method of protection is not as restrictive as some of the techniques used in the industry. A VisiTerm diskette will CATALOG normally and display each file like a standard 3.3 disk. It will also allow changes to the programs on the disk without causing abnormal behavior.

Screen Display

Figure 1 shows an actual screen dump of a VisiTerm display. I created all the text on this screen with the exception of the bottom line. This line is reserved by VisiTerm as a status line.

The "COL- 1" is a column counter indicating that the next character will be typed into column one. The "HALF DUPL" indicator tells us whether we are in half or full duplex communications.

The "SET A" informs us that character set A is in use. This line also indicates when an escape key has been pressed and when the CAPS LOCK is activated.

The screen display of VisiTerm dynamically proportions characters as they are written to the screen, courtesy of high-resolution graphics. In this way, a larger number of characters can be displayed on a single line. The actual number depends upon the number of upper and lower case characters, but, given typical lines of text, 75 columns or more can usually be displayed. All of this is accomplished using only the VisiTerm software. No 80-column card or lower case adapter is required.

This display technique has several advantages as well as disadvantages. First, it permits several different character sets to be supported. Second, it allows smooth scrolling, which is much better than the line by line scroll of a typical Apple screen. Third, this technique also permits the spacing between lines to be altered by the user. Invoking or changing any of these features can be done while on-line.

While, on one hand, it is best to have the maximum number of characters on one line; on the other, there are times when rigidly fixed columns are desired, such as when you are displaying a column of numbers. With VisiTerm, if you want to display such a column of numbers a different character set must be loaded.

This character set is not much different from the standard Apple set and, therefore, does not allow a great number

Ken R. Hancock, 1544 Lakewood Road West, Edmonton, Alberta, Canada, T6K 3J4.

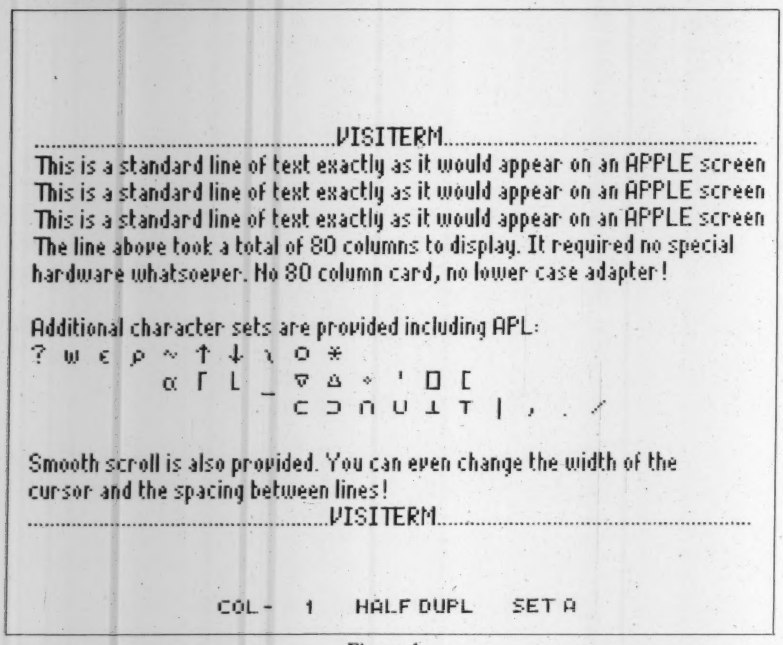
.....VISITERM.....
This is a standard line of text exactly as it would appear on an APPLE screen
This is a standard line of text exactly as it would appear on an APPLE screen
This is a standard line of text exactly as it would appear on an APPLE screen
The line above took a total of 80 columns to display. It required no special
hardware whatsoever. No 80 column card, no lower case adapter!
Additional character sets are provided including APL:
? ω ε ρ ~ ↑ ↓ ι ○ *
α ⌈ ⌊ _ ∇ ∆ ∘ ' ⌷ ⌈
⊂ ⊃ ∩ ∪ ⊥ ⊤ | , . /
Smooth scroll is also provided. You can even change the width of the
cursor and the spacing between lines!
.....VISITERM.....
COL- 1 HALF DUPL SET A

Figure 1.

```
DISK VOLUME 254

 A 000  SERIAL-NUMBER:0286740362

 A1000
 A 000     BY TOM KEITH
 A 000    COPYRIGHT 1981

*A 002 INIT
*I 002 APPLESOFT
*B 067 VISITERM
 B 016 MONO-SPACE        <VT-CONFIG>
 B 016 CURSIVE & SHORT   <VT-CONFIG>
 B 016 UPPER CASE        <VT-CONFIG>
 B 016 VISIBLE CTRL      <VT-CONFIG>
 B 016 REG & BOLD        <VT-CONFIG>
 B 016 DEFAULT           <VT-CONFIG>
*A 004 FP TO TEXT
*I 004 INT TO TEXT
*B 002 CRUNCHER
*A 005 BIN TO TEXT
*A 004 TEXT TO BIN
*A 011 CHECKSUM
*A 045 PRINT
 T 002 SAMPLE
 T 002 DEFAULT.PRINTER
```

Figure 2. Typical VisiTerm 'catalog.'

of characters on a line (70,MONO-SPACE). But, it is still true, that for most text transmissions VisiTerm is as good as an 80-column card.

File Handling

VisiTerm itself will work with only two types of files: a 16-sector binary configuration file or a text file format used to store data transmissions.

Figure 2 shows a CATALOG of a VisiTerm disk. All the files shown are supplied with every VisiTerm package.

Six of the first file type, the 16-sector binary file, are supplied with VisiTerm. These are the files that are followed by "<VT-CONFIG>." They not only save the character sets but all the current VisiTerm settings as well. They could be likened to a snapshot of the VisiTerm operating mode.

Of the second file type, only one short example is supplied. This is the text file called SAMPLE. It is a short Applesoft Basic program that has been converted to a text file.

Thus, VisiTerm will transmit only text files. But, it supplies four conversion programs that allow you to send and receive the four file types—Applesoft, Integer, binary and text. To transmit an Applesoft Basic program, for example, you would run the Applesoft program called FP to TEXT, which would then prompt you for the program you wish to convert.

You may have noticed that two conversion steps seem to be missing. It appears that Personal Software neglected to supply a TEXT TO FP or TEXT TO INT program. In fact, neither of these programs is necessary. This is because any standard Apple will automatically convert from text to Basic by means of the EXEC command.

That is, if you have just received a text file that you wish to convert to Basic, simply type "EXEC filename" and the text file will be converted to a Basic program residing in memory. Remember to type NEW prior to executing this command or you will end up with an unfortunate merge of two programs.

The BIN TO TEXT program works in an unexpected way; it converts all binary characters to their equivalent hexadecimal representation. Thus, a control-m character, equivalent to a carriage return, would be transmitted as an ASCII "O" followed by an ASCII "D." A conversion like this is necessary because of the difficulties involved in transmitting an unaltered binary file.

For example, suppose we had a short binary program in memory that we wished to transmit. Also suppose that this short program contained an absolute ORA instruction. Well, as it happens, the hex code for an absolute ORA is OD, which is a carriage return, as previously mentioned. As you can see, there would be no way to discriminate between carriage return and an absolute ORA instruction.

This conversion method has the unfortunate drawback of creating a text file that is about twice the length of its binary counterpart. This characteristic degrades the capacity of VisiTerm in certain cases. Since the maximum number of characters that VisiTerm can receive in one block is 18,384, the maximum length of a binary reception is only about 9000 characters. Also, this conversion method does not allow binary files that are being used as text files to be properly transmitted. The conversion will not work with an Applewriter file for instance.

File Transfer mode allows data to be transmitted or received in a block. This is the mode that would be used to transmit a text file.

All conventional transmission protocols are supported including EOB-ACK (End Of Block-Acknowledge) as well as STP-STR (Stop-Start). Auto acknowledge is also allowed as are combinations of the above. Further, VisiTerm gives you the ability to change the EOB or the ACK characters to any ASCII value. Similarly, both the STP and STR characters can be changed to accommodate nearly any convention.

Let me give you an example of a block data transmission to illustrate how these characters would be used. Suppose we wished to transmit a Basic program, line-by-line, into a timesharing editor such as the MTS (Michigan Timesharing System) editor. This editor prompts line-by-line with a question mark and accepts data in conventional ASCII.

First, we would convert our Basic program to a text file using the FP TO TEXT program. Then we would go to the VisiTerm Options mode (Escape shift 1 from the Terminal mode) and change our EOB character to a OD (since the ends of our Basic lines are marked with carriage

returns). We would then change the ACK character to a 3F which is the ASCII value for a question mark.

Next, we would go to the File Transfer mode by pressing F. We would then type in the name of the file we wish to transmit by typing "Escape filename." VisiTerm must now be told what communications protocol we wish, so we would select EOB-ACK by pressing either of the arrow keys. Provided the MTS editor is invoked, the file will be successfully transmitted by merely typing an "S" for "Send."

This is one way that data could be transmitted to the MTS system. A better way, which works very well using different EOB and ACK characters, is the MTS COPY *SINK* or COPY *SOURCE* commands.

Convenience Features

One of VisiTerm's most useful modes of operation is the Macro Definition mode. In this mode, a character on your keyboard can be made to represent a whole string of characters or commands including embedded carriage returns. If you are using a timesharing system such as The Source, this will greatly simplify your sign-on procedure.

All macro definitions are saved with all the other VisiTerm options in a <VT-CONFIG> file.

VisiTerm allows you to use your DC Hayes modem with your Apple at either 110 or 300 Baud. Unfortunately though, you cannot save a dial up number in a <VT-CONFIG> file and you must dial each time by typing the appropriate number on the Apple keyboard.

Whether you are using a DC Hayes, an Apple communications card or a 1200 baud CCS 7710 card, VisiTerm automatically locates the card and sets itself accordingly. However, you can change the slot number it suggests if you desire.

VisiTerm allows you to create or modify your own character sets.

VisiTerm allows you to set the Data Format to almost any combination of 7 or 8 bits per character, odd, even, or no parity, as well as 1 or 2 stop bits. Further, you can change the length of a break character from 0.00 seconds to 2.50 seconds in hundredths of a second increments.

VisiTerm also gives you control over such elegant things as setting the volume of the ticks which are heard when you press a key. You can also change the column number at which VisiTerm is instructed to beep automatically—72 being the standard value. Also, you can change the length of the Tab set.

You may remember from Figure 2, the VisiTerm CATALOG, that a fairly lengthy Applesoft program called PRINT was present. This is another Basic program which allows you to print a text file that is resident on your disk. VisiTerm does not allow for simultaneous printing and terminal communications. This feature would be a welcome addition.

Certainly well beyond a convenience feature, VisiTerm also allows you to create or modify your own character sets. This feature gives VisiTerm a nearly worldwide appeal—an intelligent choice for a communications program.

Conclusion

I am impressed. Personal Software received, and still receives, a shower of compliments and commendations for its VisiCalc program. VisiTerm follows in the same tradition of superb documentation and effective, stable software.

It will be no surprise to see a flurry of VisiTerm related products following in its wake. VisiTerm, like VisiCalc, will be with us for many years. □

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CIRCLE 139 ON READER SERVICE CARD

creative computing equipment evaluation

128K Memory System for Atari

David Small

A while ago a group of employees left Atari and formed Axlon Co. to manufacture add-on products for the Atari computer. They produce a 32K RAMCram card, and a 256K RAM system, complete with expansion interface.

So when ads began to appear for their RAMDisk, I was intrigued. I couldn't resist calling them for more details.

They turned out to be most friendly and mailed me a loaner RAMDisk for evaluation. This review is based on my use of the product for a month.

The RAMDisk arrives in a 9" x 11" x 1" blue box which contains a manual, a diskette, and a memory cartridge. The manual is housed in an attractive notebook with the diskette in a side pocket.

The memory board looks like an Atari 16K cartridge except that it has no top or sides. (It does have front and back covers, though.) This is probably to help the RAMDisk get rid of heat.

The manual is well written, and very, very clear. I decided to trust it immediately, and began following the setup directions.

Getting Started

First, one boots up the system with a normal Atari 2.0S DOS disk. The Axlon disk is fast formatted and uses Atari directory formats and such, but does not contain DOS.SYS or DUP.SYS, so you can't boot up with it. Next, I ran a Basic program called CREATE to create a boot disk (a disk used whenever the system is powered up or re-booted). Following the instructions, I put in the Axlon disk, then a blank disk, and created a boot disk. No problem—very easy to do.

Next, I turned the computer off, removed my middle 16K board, and put in the RAMDisk. Two memory boards are required, for some reason, on either side of the RAMDisk. Perhaps they keep it from getting the electrical equivalent of lonely.

Then, I booted up using the new boot disk. A most foreboding message flashed onscreen for about five seconds, just long enough for a speed reader to comprehend it. It pointed out that the Axlon MMS (Memory Management System) was an end-user initiated change to Atari DOS and that Axlon doesn't condone making copies and distributing them.

Here is my first complaint with the MMS, Axlon's DOS 2.0S: you have to sit through this silly legal message *every* time you boot up with the MMS disk. The first time, it's fun, and even witty. The second time, half witty, and after that, not funny at all. I was ready to disassemble the boot file and "short out" the message after a month of seeing it.

Once you're through the message, you get to Basic or whatever you're running. The RAMDisk hardware operates just like a normal 16K cartridge unless you specifically tell it not to. There's just about the same amount of free memory as before. So I typed DOS.

Next surprise. No click, whirr of the disk. The DOS menu popped up right away, just like the old DOS 1, but apparently without the memory sacrifice, according to FRE(0). And my, how the DOS menu has changed.

The Menu

First, the top line is not Atari 2.0S anymore. It is the Axlon RAMDisk MMS System V1.0. Most of the options look the same, but two are disabled: writing DOS files and creating MEM.SAV.

Second complaint. I don't care about MEM.SAV; I never use it. But I want to be able to write the DOS files after formatting a disk. The DOS and DUP files are on nearly every disk I have, making for few bootup problems. But Axlon doesn't want complaints about folks copying DOS, so they disabled it. Aside from these two changes the menu is a duplicate of the Atari 2.0S menu.

How do you use the RAMDisk? The RAMDisk contains 128K bytes of memory. A diskette contains around 90K. So the Axlon MMS makes "disk #4" the RAMDisk memory area. You literally use the 90K of the memory board as disk number 4.

You can copy to it, open files on it, close them, NOTE/POINT them, and so forth. You can copy an entire disk to RAM. You can run directories, lock files—everything you can do to a normal disk—to the RAMDisk (disk 4). In short, the RAMDisk replaces disk 4.

Here's an example. Let's say I have one disk drive and I need to duplicate a disk. I load the Axlon MMS, go to DOS, and J (duplicate disk) from 1 to 4. This copies the whole diskette into RAM. Next, I put in my destination disk, and copy from 4 to 1. All done. (No more swapping diskettes back and forth.) This is very nice and very easy. It is also fast. I could load 220-sector binary files in less than a second from the RAMDisk. This compares to more than 30 seconds for a disk drive.

Software houses should take note here. The RAMDisk is a very good thing for

David Small, 11314 Yucca Dr., Austin, TX 78750.

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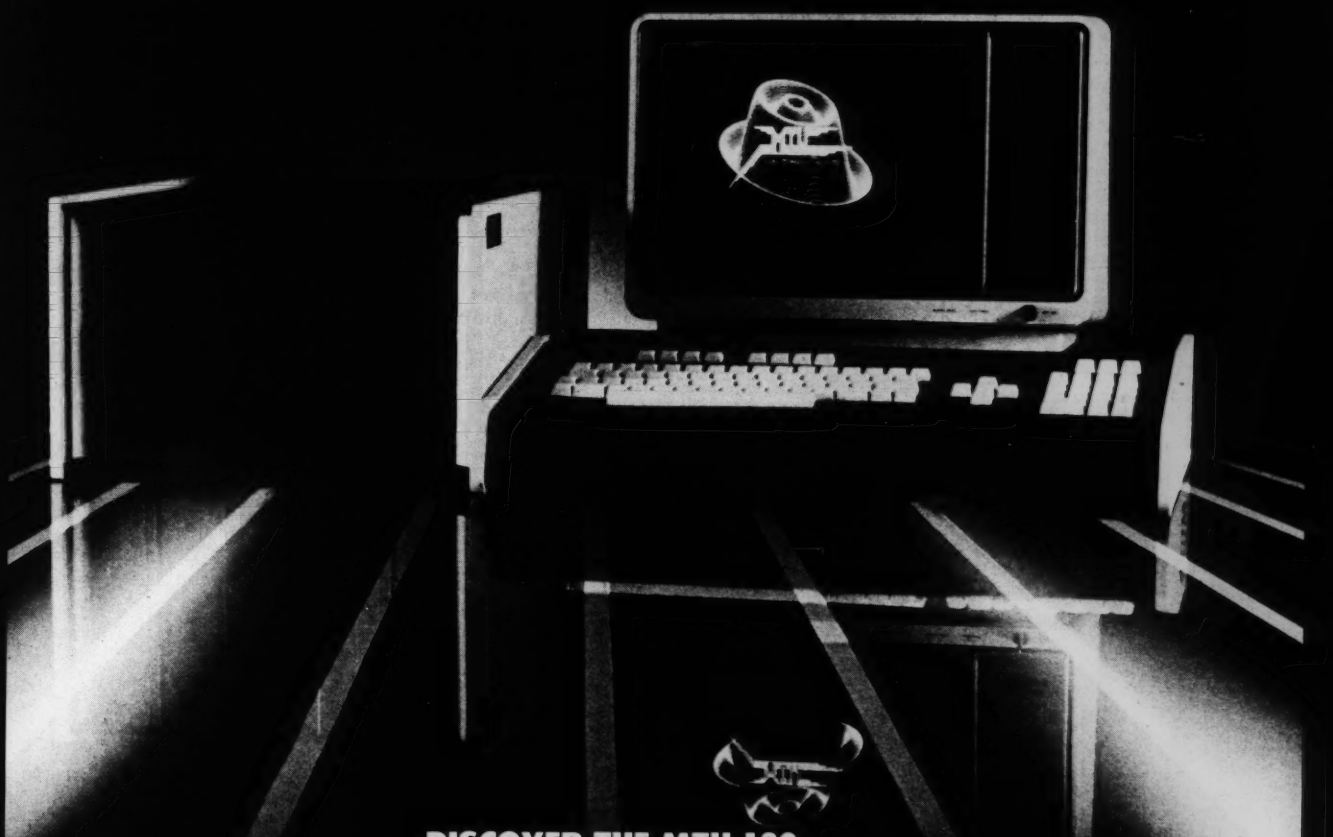

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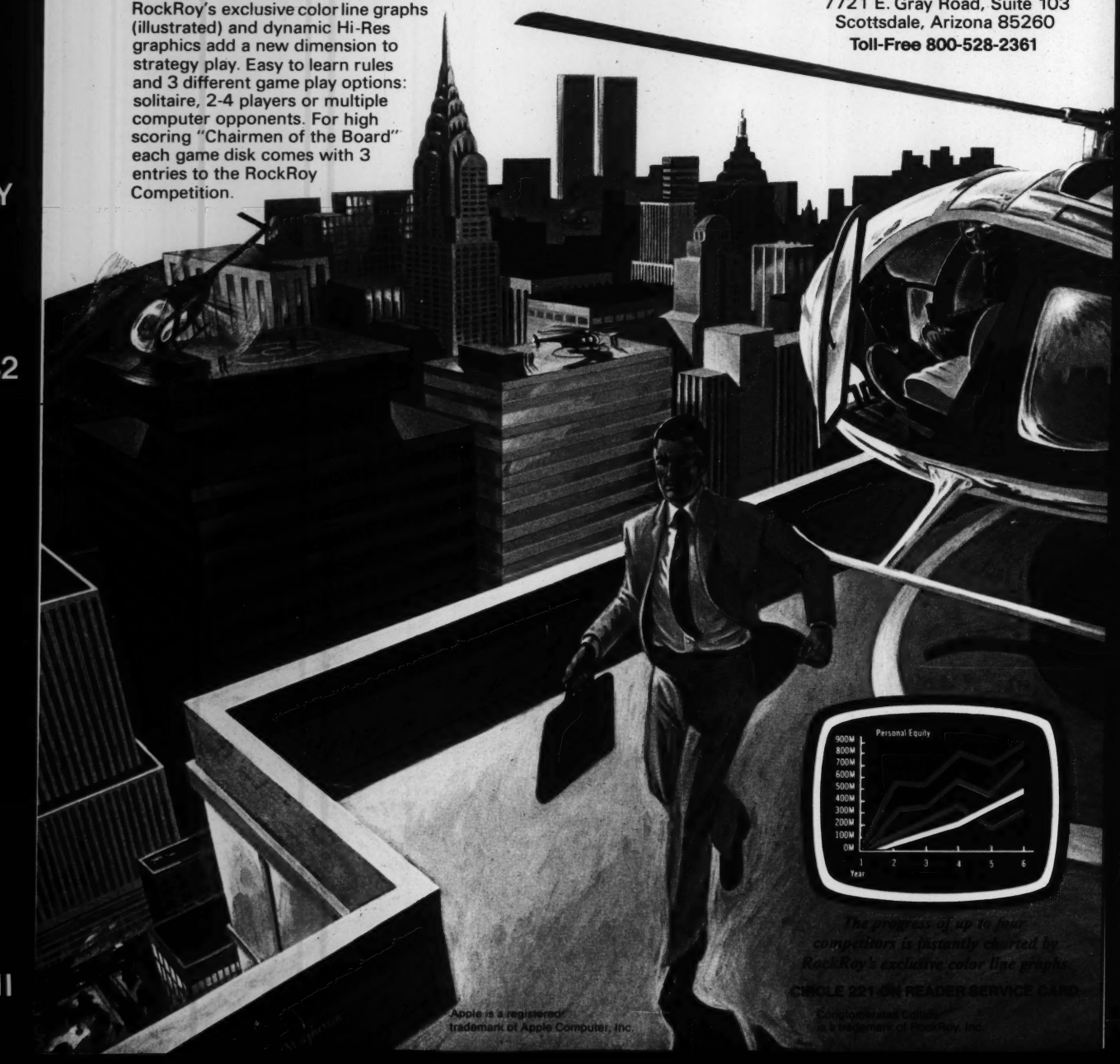

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CIRCLE 221 ON READER SERVICE CARD.

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you. Let's say you need to make 100 copies of a given diskette. Without the RAMDisk, you can either use two drives—one to read the master and one to write the destination disk (wearing the master and its drive out)—or use one drive and swap disks like mad. With the RAMDisk, you copy the master into RAM, then proceed to make your copies from RAM. This product would well pay for itself in saved time and disk drive wear—heavy use is hard on Atari drives. (By the way, I found that DOS and DUP did copy if I used the DUP DISK option; you just can't create them originally).

From Basic Assembler, and so forth, the RAMDisk is just disk 4. SAVE or LOAD; the operations run very fast. Anyone with a program that is running slowly due to disk I/O should look into the RAMDisk. A speedup factor of 20 would be easily achieved, and that's conservative. In addition, you needn't put up with disk errors and the like.

This is a solidly built, well documented product.

How It Works

By now you're probably curious how this thing works, so here's what I found (in the manual, all clearly laid out). In the Atari, the address space from 4000 to 7FFF is normally the second 16K board installed in the machine. The RAMDisk allows 4000-7FFF to be any of eight individual 16K boards, one at a time. Due to many arcane hardware considerations you can't access all 128K at once, only a 16K chunk of it. But *which* 16K is instantly selectable. This is called "bank selection."

For example, Axlon apparently puts their MMS DOS Menu on one of the 16K banks. Then, to switch to DOS, they just select that particular 16K, and run (that's why DOS comes up so fast). But also note that DOS does not take up normal 16K programming space this way; the contents of the 16K you were working in before you typed DOS are on another of the 16K boards, ready for use as soon as it is reselected. (The MMS handles the swapping back and forth to use the 90K disk area).

If you're confused, just imagine you have a pile of eight 16K memory boards and you could plug or unplug them at will into the middle slot. This is how the Axlon board works.

This product could well pay for itself in saved time and disk drive wear.

Physically it uses Motorola 64K x 1 chips. The raw cost of the chips on the board I calculated to be around $250, so the price of the board is quite reasonable. The construction of the board is very high quality.

Uses

Extremely high speed animation is possible using bank selection. You don't have to use the Axlon board as a RAMDisk. You can select which 16K you want directly. So several images (display lists and memories) can be stored, and switching between them determines which image is being displayed. Some impressive effects could be obtained (only) this way. Alas, I didn't have time to do much of this.

One thing I did use the system for was holding temporary files during developmental work. By having the RAMDisk hold various versions of a Basic program I was developing (with SAVE), I greatly speeded up the development time. However, there is a problem with this: turning the Atari off causes the contents of the board to be lost. And I have locked up the Atari past RESET working many, many times.

The diskette that comes with the RAMDisk also has several options to check the board out and fiddle with MEM.SAV. It even has a complete copy of the manual (over 300 sectors) as files.

Disadvantages

And now I come to the parts I don't like about the RAMDisk.

I have already mentioned a few points, but my main problem with this unit is that it is a limited function device. It is like a plotter; some people can use it, others can't. Software houses and people with heavily disk-bound programs could make great use of this product. People who need incredible animation memory also could. But I can't for the life of me think of another use for it. It was a nice convenience when copying disks, but it just wasn't that great a help. It would take a volume operation for it to make a difference. For your average Atari user, another disk unit, which costs the same (or even a bit less) is probably a better buy. You can just do more with it.

Technical Aides

The bank selection is done in the C000 area, currently unused by Atari. My Atari sources tell me this will change in a year or so, as the operating system acquires more capabilities. The Axlon people will have to modify their board at that time.

Sector copying programs do not work with this board.

Microsoft Basic has real problems with this board. I tried the whole month to get them to work together and couldn't. As the new Basic is just plain wonderful and everyone will be buying it, the Axlon people had better get some new software out fast.

The board throws only minimal RF interference, and if you run your Atari without the top cover on for heat dissipation, you will notice minor wavy lines on your TV.

Axlon plans a RAMDisk for Apple II and Apple II Plus computers in the near future.

Conclusion

This is a solidly built, well documented product. It has several very useful applications. People who can use it in those applications will be most pleased with it. But those who want high speed disk I/O or temporary storage will not find it of much use. It certainly expands the capabilities of the Atari, but you may not need your capabilities expanded in that direction. Consider it as you would a piece of other special purpose peripheral equipment, such as a digitizer or modem. Will you use it? If so, it is a good product.

RAMDisk, Axlon Co., 170 N. Wolfe Rd., Sunnyvale, CA 94086. $699. □

"When you're through Dad, I want to write a program to experiment with the effect of a different coefficient on a plot of a polynomial of the form $Y(X)=A*X^2+B*X+C$"

Polly, Put The Kettle On

Richard A. Zatarga

I have owned a BSR X-10 control system for several years and have been intrigued with the possibility of somehow controlling the modules with my TRS-80 Model I computer. Recently, several hardware interfaces have been introduced to perform this function. These interfaces range in price from less then $40 to over $200.

The cheaper units usually provide a sonic link from the computer to the BSR Command Console. The more expensive units operate without the console, i.e., they send the signal directly from the interface, through the house wiring, and on to the control modules. Some controllers come complete with the necessary software for them to function. Others offer software as an optional extra.

In my search for the right computer-to-X-10 controller, I made a list of attributes I felt the unit should possess. It had to be relatively inexpensive. It had to be compact. (I don't have too much room left on my desk.) I didn't want a sonic link type controller. My command console is centrally located in my house, and quite some distance from the computer. I had no desire to move the console every time I wanted the computer to control the modules.

It also had to be permanently installed without affecting the operation of other peripherals; I didn't want to remove and attach cables to use the controller. Lastly, it had to be easy to use and program so other members of the family could readily operate it.

My quest came to an end when I received a TRS-80 Plug 'n Power Controller. The price is only $39.95. It is only 4.5" x 4.25" x 1.5" in size, and the command console is not required—no sonic link. It attaches to the cassette DIN jack on the TRS-80 and the cassette recorder plugs into the controller.

Richard A. Zatarga, 800 Towner Swamp Rd., Guilford, CT 06437.

A single rocker switch on top of the unit selects either cassette or controller operation. Finally, the Plug 'n Power Controller came complete with the software to satisfy all computer configurations for which the unit was designed—TRS-80 Models I and II, and the Color computer.

Documentation

The TRS-80 Plug 'n Power Controller comes with two cassette tapes and an instruction booklet. The 36-page instruction booklet exceeds Radio Shack's high standards for documentation. It is clear, concise, and complete concerning the installation, operation, and programming of the controller.

Set-Up

It only takes five minutes to attach the controller to the computer permanently. You simply unplug the cassette cable from the computer and plug in the cable from the controller. Plug the cassette cable into the DIN jack on the controller and the line cord of the controller into an AC outlet.

In order for the computer to activate the X-10 modules through the Plug 'n Power Controller, a software link or operating program must be loaded into memory. This is a machine language program for the Level II machines and a Basic program for the Color and Level I computers. To load a Level II version of the operating program, you set the rocker switch on the controller to CASSette and enter the following:

```
SYSTEM ENTER
*? L ENTER
```

Set the rocker switch to conTRoL and enter a slash (/) after the second question mark (?) to execute the program.

Operation

The controller may be operated in either a direct command or a programming mode. I really can't see any purpose for the direct command mode. It is faster and easier to turn a single appliance or lamp on and off directly than it is to power up the computer, load the operating program, enter the time, and finally, issue a command to a module via the computer keyboard.

In the programming mode, however, the Plug 'n Power Controller is a very useful tool. In this mode you can program a sequence of commands to turn lights and applicances on and off at different times over a period of hours, days or even weeks. Your only limitation is a maximum program length of 45 lines, i.e., 45 separate commands.

Once a program sequence is entered and executed, it will continue to function even after the last line of the program has executed. The sequence of commands will repeat again and again, starting with the first program line. For example, if you program a three-day sequence of commands and are away for five days, the first day's command sequence will begin to repeat on the fourth day. In fact, the whole three-day sequence will repeat indefinitely, unless there is a loss of power and the operating program is lost.

Both operating modes use the following six control commands:

ON: Turns on the selected module.

OFF: Turns off the selected module.

CLR: Turns off *all* modules for a selected house code.

ALL: Turns on *all* modules for a selected house code.

The following two commands only work with the lamp and wall control modules. They will not work with the appliance modules.

DIM1-DIM9: Decreases or dims the level of light intensity for a selected module. The number after the command determines the level of intensity.

BR1-BR9: Increases or brightens the level of intensity for a selected module.

Programming mode commands allow you to (I)nsert, (R)eplace, (E)dit, (D)elete and (L)ist program lines. One command,

controlling one module, is allowed per program line. However, up to eighteen commands can be executed at the same time by using the same execution time in two or more program lines.

A program line must contain the following five items of information:

- A line or sequence number.
- The time the command will execute.
- The house code of the module being commanded. (A thru P)
- The unit code of the module being commanded. (1 thru 16)
- The command (on, off, etc.)

Line numbers are automatically displayed by the operating program and do not have to be entered. The other items are keyed into the program line individually, with each item followed by a carriage return (Enter). After the four items have been keyed into a program line, the next line number is displayed, ready for a new command. Table 1 shows an example of a two day sequence of commands to give you an idea of the format.

Table 1.

Line Number	Time	House Code	Unit Code	Command
01	07:00	A	03	OFF
02	07:00	B	14	ON
03	07:25	B	14	OFF
04	19:30	A	03	ON
05	07:00	A	03	OFF
06	09:30	B	14	ON
07	09:55	B	14	OFF
08	19:30	A	03	ON

A scenario for the above commands might be:

Day 1
01 7:00 a.m.—Turn off outside security light.
02 7:00 a.m.—Turn on coffee pot.
03 7:25 a.m.—Turn off coffee pot.
04 7:30 p.m.—Turn on outside security light.

Day 2
05 7:00 a.m.—Turn off outside security light.
06 9:30 a.m.—Turn on coffee pot. (Must be Sunday)
07 9:55 a.m.—Turn off coffee pot.
08 7:30 p.m.—Turn on outside security light.

Conclusion

I have nothing but praise for the unit. It has performed flawlessly since the day I hooked it up. Its only limitation is the 45 program line maximum of the operating program. This limit precludes a multi-week program of commands that contains any degree of time and sequence sophistication. However, I considered this to be a minor flaw in the design of the controller. Since it is the software that is at fault, a little programming and experimentation should overcome the flaw completely.

So, if you want to foil burglars by giving your home that lived-in appearance while you are away, or just want the luxury of having your coffee ready when you get out of bed in the morning, you can't go wrong with this cost effective remote control computer interface from Radio Shack. □

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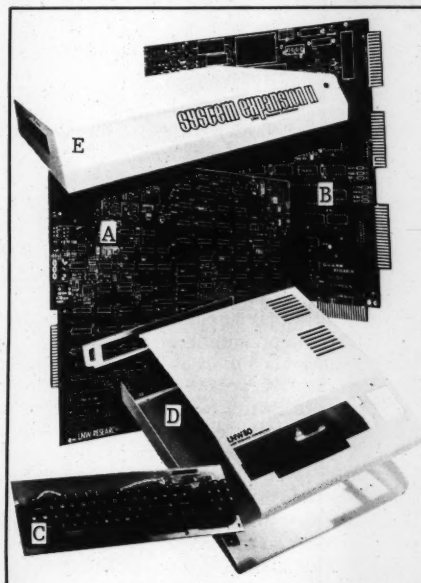

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Adventures in Adventureland

Dale Archibald

For all of you who love Conan the Cimmerian, who drool at Frazetta's muscle-men and scantily-clad ladies, who won't buy any book unless it has a lurid cover *a la* Kilgore Trout, who would play Dungeons and Dragons the entire weekend—here is a collection of games made to order.

I don't even pretend to understand why there are so many renditions of dank clammy caverns to be played on these glossy little machines of ours, but there are. It sometimes seems we're caught between the pit and the place without atmosphere.

I imagine it is simply because the majority of these games are interesting. Who wants to sit and stare at the boob tube when he can be involved in derring-do, battling dragons, orcs and other slithy toves? Let the "booboisie" of H.L. Mencken stare, we'll interact.

Dale Archibald, 1817 Third Ave. N., Minneapolis, MN 55405.

creative computing
SOFTWARE PROFILE

Name: Ultima

Type: Graphic adventure

System: 48K Apple II with Applesoft in ROM, or II+, 3.2 or 3.3 Disk Drive(s)

Format: Disk

Language: Applesoft and machine language

Summary: An engrossing adventure, from the depths of dungeons to outer space.

Price: $39.95

Manufacturer:
California Pacific Computer Co.
1623 Fifth St.
Davis, CA 95616

Ultima

One of the most recent entries in the parade of adventures is *Ultima*. I was familiar with this company's *Akalabeth*, having played it some time back. *Akalabeth* wasn't an overly impressive game, although it had some good features.

Ultima far surpasses that earlier effort. The major author of *Ultima*, recently revealed in *Softalk* as Richard Garriott of Austin, TX, works under the *nom de chip* of Lord British, with the help of several other people.

This game is like an onion; it has layer after layer after layer of intrigue. I have been told that there are over 16,000 squares of land—4096 per continent on four continents. You will use two disks, one for the program, the other for your character (and the towns, castles, and continents).

There are roughly eight dungeons and eight towns per continent and two castles. All told, there are four kinds of kings. Each of the kings will enlist you in a different

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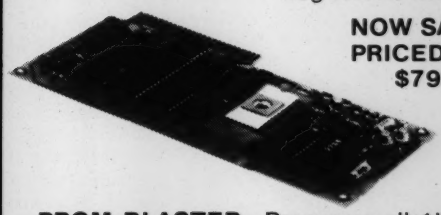

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THE EXTENDER by Scott Knaster. With Apparat's new Apple software package, The Extender, you can use the full power of PRINT USING from Applesoft, determine the amount of free space remaining on a diskette from within your programs, generate automatic line numbers, and much more.

The Extender provides 15 powerful statements and functions to make Applesoft programming easier. These commands add to your capability in business applications, graphics, debugging, disk management, and advanced programming.

Here is a brief description of some of the commands provided:

- PRINT USNG - Easily formats output in columns, with automatic rounding, floating dollar sign, asterisk fill, preceding or trailing sign, and more features than any other similar system.
- AUT - Provides computer-generated automatic line numbers.
- DEC and HEX - Provide built-in conversion between hex and decimal. These functions can be used with POKE, PEEK, and CALL statements for easy programming.
- DISKFR - Instantly computes the amount of disk space free on any standard DOS 3.2 or 3.3 diskette.
- EDIT - Allows easier editing of Applesoft program lines by providing full-widths listing. Eliminates typing POKE 33,33 to eliminate spaces.

The Extender works with your Applesoft programs by using the '&' command. Just boot with the Extender disk, then run, edit, or change your programs as usual, with all the power of these 15 additions at your fingertips.

The Extender comes on a 3.2 diskette and is fully compatible with both DOS versions 3.2 and 3.3. The Extender requires an Apple II or Apple II Plus with at least 32K, Applesoft in ROM or Language System, and a minimum of one disk drive.

Complete documentation is included with examples of usage for clarity and ease of implementation.

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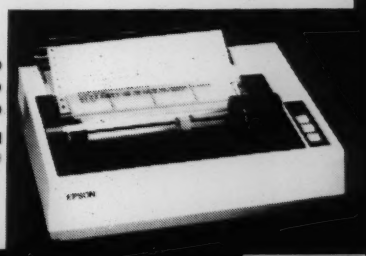

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type of quest, and as you succeed at each, will give you a gift on your return to his castle.

By the way, why couldn't the program have one queen in place of a king? This insistence on mild sexism is one of the worst oversights in the program, and for that matter the whole genre. Must adventure game publishers always picture women as either "tavern wench-with-no-clothes" or "warrior maiden-with-no-clothes"?

In the instruction books, the men are usually shown dressed as if they're ready for a day in the gladiatorial mines, while the women are portrayed mini-skirted and sleeveless, albeit carrying a sword. The only two women in this scenario are an imprisoned princess and a tavern wench.

But, to continue: *Ultima* has various levels of adventure, whether you tour the ten-level dungeons, travel around the land or ocean, or go into outer space.

As you create your character, you are allotted 90 points to assign to strength, agility, stamina, charisma, wisdom, and intelligence. None can be above 20 to begin, or 99 with further play. You can become human, elf, hobbit, or dwarf, and a fighter, thief, cleric, or wizard.

You receive 100 hit points, 99 days of food, two daggers and leather armor. That isn't a whole lot on this planet.

First you must ready your armor and weapons (and later any spells you want to cast). As you travel, you run into assorted enemies, such as necromancers, thieves and evil knights. You can either flee or attack with your readied weapon. Each time you overcome an adversary, you receive his gold and experience points.

If you should decide to enter a dungeon, the scene changes. From the hi-res graphic above ground, you plummet into a simple three-dimensional line drawing of the dungeon. This changes as you walk along, controlling movement with the return-right arrow-left arrow and slash keys. Return moves you forward, slash turns you around, and the arrow keys send you in the matching direction.

These are tough dungeons, but fair: they don't change each time you enter them, so they're mappable. You can go back to the surface to resupply or purchase better arms. The graphics (a transfer from *Akalabeth*) are very simple, but they work. You can inspect for secret doors and pits.

You can be surprised, however; your attacker or attackers can be swinging at you while you are trying to decide where they are. You must face a monster before you can hit it.

With a distance weapon such as a bow and arrow (or, later in the game, a blaster), you can attack a distant monster. If you have purchased magic spells, you can cast one you have readied, such as a magic missile (good one square in front of you).

As you travel, you run into assorted enemies, such as necromancers, thieves, and evil knights.

You have to ready the weapon or spell, then wait until the next turn to use it. (Turns can be adjusted for lag-times of 0-9.)

There is a constant annoying flicker on the screen as you walk through the dungeon. This may be because this part of the program was written in Applesoft. I wish the sound of battle could be turned off: the "boink-zap" is very tiring after a few repetitions.

If the attacker is a thief, he can steal from you, but even if you defeat him, you can't retrieve the lost items.

Return to the surface, and you will have hit points added to your remaining ones. This is how you build hit points, although you can also buy them from the kings.

Enter the town, and the graphic changes. There are stores selling food, arms, armor, transportation and magic, and a pub. Among the townsfolk are large guards and a bard. The bard is one of two moving characters (the bar wench is the other) on the screen. If the bard touches you, he may rob you. Kill him, and you'll be sorry.

Among the types of transportation you can purchase are a horse, a frigate, and later an aircar and a space shuttle. The aircar can go over water or land; the space shuttle takes you into space. Once in space, you can take on enemy ships.

There are still some bugs in the program the company hasn't been able to exterminate. Normally, you can save your character at different points. However, when you reboot, you may have lost your transportation. So don't quit the game if you are on an island. Also, when my wife's character was killed, she was reincarnated in the middle of the ocean. So save the game regularly.

Garriot is working on the sequel to *Ultima* now. California Pacific promises it will be even better. That will be awfully hard to accomplish, because this is an adventure of truly epic proportion.

creative computing
SOFTWARE PROFILE

Name: Wizardry
Type: Graphic adventure
System: 48K Apple II or II+, 3.3 Disk Drive
Format: Disk
Language: Run-time Pascal
Summary: A sure winner.
Price: $49.95
Manufacturer:
Sir-Tech Software, Inc.
6 Main St.
Ogdensburg, NY 13669

Wizardry

David Lubar reviewed an early copy of *Wizardry* in the May, 1981 issue of *Creative*, and I decided to look at it.

The program was written by Andrew Greenberg, Inc. and Robert Woodhead, Inc. The two Incs have wrought wondrously well.

This multi-player or solitaire game has to be ranked at the top for playability. It is an entrancer.

There are some 14,000 lines of code in this program in run-time Pascal. Since it is so long, and because of the language, your disk drive must be set exactly right. I discovered mine was quite fast; I could load any Basic, machine or assembly language program—but not this one.

My wife is a fanatic about this game. Since we first received an early copy, she has uncovered many of the bugs by virtue of raising some of her characters to sixteenth level and acquiring 1.3 million experience points. (I said she was a fanatic.) The program, by the way, is fairly nonsexist.

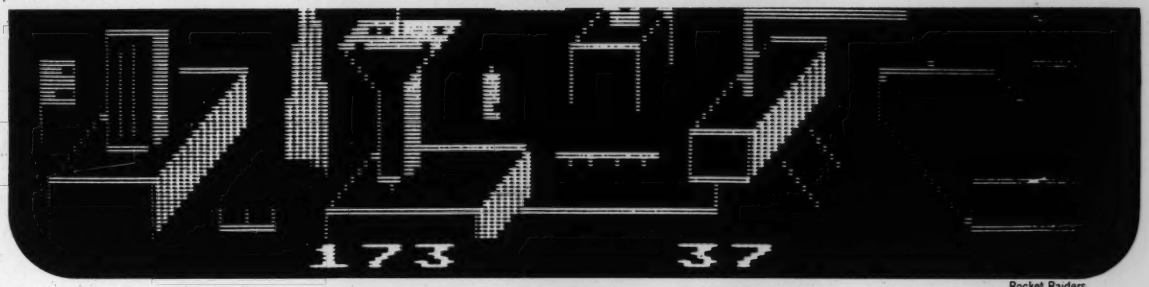
Unlike *Ultima*, there is only one quest here: to recover a valuable item stolen from the mad overlord Trebor by the evil mage Werdna. It has been hidden in the depths of the overlord's dungeon, perhaps the tenth level down. However, when a priest tried to find the body of a missing warrior, the spell told the party the body was on the eleventh level. To date, no one has lived long enough on the tenth level to discover any deeper ones!

The player can have as many as 20 named characters in training at any one time, and you can see how they all have unique personalities. The difference in point distributions—strength, IQ, piety, vitality, agility, luck—makes a great deal of difference in handling them.

In a melee you would have the most effective fighter go after the magic user in the opposing party for example. There can be as many as four different types of attackers in a melee.

Each of your characters can be directed at a specific attacking group.

This nurturing and development of the characters is one of the most entertaining and engrossing aspects of *Wizardry*. You can learn their qualities, and their abilities. You can mix experienced hands with beginners.



Rocket Raiders

Our High Quality Software Is More Than A Stroke Of Genius... It's A Work Of Art.

☐ **PM EDITOR:** by Dennis Zander (Atari, 16K)
Create your own fast action graphics game for the Atari 400 or 800 using its player missile graphics features. By using player data stored as strings, players can be moved or changed (for animation) at machine language speed. All this is done with string variables (PO$(Y)=SHIP4). This program is designed to permit creation of up to 4 players on the screen, store them as string data and then immediately try them out in the demo game included in the program. Instructions for use in your own game are included. PM EDITOR was used to create the animated characters in **ARTWORX** RINGS OF THE EMPIRE and ENCOUNTER AT QUESTAR IV.
PRICE ..... **$29.95** cassette **$33.95** diskette

☐ **ROCKET RAIDERS** by Richard Petersen (Atari 24K)
Defend your asteroid base against pulsar bombs, rockets, lasers, and the dreaded "stealth saucer" as aliens attempt to penetrate your protective force field. Precise target sighting allows you to fire at the enemy using magnetic impulse missiles to help protect your colony and its vital structures.
PRICE ..... **$19.95** cassette **$23.95** diskette

☐ **INTRUDER ALERT!** by Dennis Zander (Atari, 16K)
This is a fast paced action game in which you must escape from the "Dreadstar" with the secret plans. The droids are after you and you must find and enter your ship in order to escape. If you fail, the rebellion is doomed. **PRICE** ..... **$16.95** cassette **$20.95** diskette

☐ **THE RINGS OF THE EMPIRE:** by Dennis Zander (Atari 16K)
The Empire has developed a series of battle stations protected by one or more rings of energy. You must destroy these weapons by attacking them in your Y-wing fighter armed with Zydon torpedoes. Each time you blast through the rings and destroy the station, the Empire develops a new station with more protective rings.
PRICE ..... **$16.95** cassette **$20.95** diskette

☐ **FOREST FIRE!:** by Richard Petersen (Atari 24K)
Using excellent color graphics, your Atari is turned into a fire scanner to help you direct operations to contain a forest fire. You must compensate for changes in wind, weather and terrain. Not protecting valuable property can result in startling penalties. Life-like variables make FOREST FIRE a very suspenseful and challenging simulation. **PRICE** ..... **$16.95** cassette **$20.95** diskette

☐ **GIGA TREK** by John Shepard
(Atari (24K) Apple, North Star and CP/M (M-BASIC).
Giga Trek has features not found in other "Star Trek" games including movement and a trigonometric coordinate system for navigation. It is your task during play to destroy the combined fleet of Klingons and Romulons that are menacing the Federation throughout the galaxy.
PRICE ..... **$14.95** cassette **$18.95** diskette

☐ **KALEIDOSCOPE** by Clinton Parker (Atari 16K)
Turn your computer into a color kaleidoscope of ever changing patterns. This assembly level program will generate sequences of patterns which will not repeat for days. A graphic spectacular!
PRICE ..... **$14.95** cassette **$18.95** diskette

☐ **GIANT SLALOM:** by Dennis Zander (Atari, 16K)
Bring the Winter Olympics to your computer anytime of the year! Use the joystick to guide your skier's path down a giant slalom course consisting of open and closed gates. Choose from three levels of difficulty. Take practice runs or compete against from two to eight additional skiers.
PRICE ..... **$15.95** cassette **$19.95** diskette

☐ **HODGE PODGE:** by Marsha Meredith
(Apple 48K, Applesoft or Integer BASIC)
This captivating program is a marvelous learning device for children from 18 months to 6 years. HODGE PODGE consists of many cartoons, animations and songs which appear when any key on the computer is depressed. A must for any family containing young children and an Apple.
PRICE ..... **$19.95** diskette

☐ **THE PREDICTOR** by Thomas Barker
(Apple, Atari, TRS-80, North Star and CP/M (M-BASIC)
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☐ **THE VAULTS OF ZURICH:** by Felix and Greg Herlihy (Atari, 24K, PET)
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☐ **BRIDGE 2.0** by Arthur Walsh (Atari (24K), Apple TRS-80, PET, North Star and CP/M (MBASIC) systems)
Rated #1 by Creative Computing, BRIDGE 2.0 is the only program that allows you to both bid for the contract and play out the hand (on defense or offense!). Interesting hands may be replayed using the "duplicate" bridge feature. This is certainly an ideal way to finally learn to play bridge or to get into a game when no other (human) players are available.
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☐ **ENCOUNTER AT QUESTAR IV:** by Douglas McFarland (Atari, 24K)
As helmsman of Rikar starship, you must defend Questar Sector IV from the dreaded Zentarians. Using your plasma beam, hyperspace engines and wits to avoid Zentarian mines and death phasers, you struggle to stay alive. This BASIC/Assembly level program has super sound, full player missile graphics and real time action.
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The nurturing and development of the characters is one of the most entertaining and engrossing aspects of Wizardry.

The display gives you all information at a glance. If you see a group of monsters, you know you are being attacked; you don't need a message from the computer intruding on your consciousness. The view of the dungeon is three-dimensional, so you can map it.

Having a group to draw on during dungeon forays allows a matchup of talents between fighters and magic users. For instance, priests have healing and hurting abilities, while mages have only hurting ones. A few types of characters have both fighting and magic-using capabilities.

You assemble your group of six in the tavern, arm them at Boltac's if necessary, then head for the edge of town and the maze. Once down, you line them up in the order you want (since the dungeons only allow three abreast, put fighters in front).

In addition to the three types of characters mentioned already, there are evil ninjas, good lords, thieves, bishops and samurai.

With the wittily-illustrated instruction book and the utilities to change names, or transfer characters from adventure to adventure (Woodhead reports he is working on a two-disk adventure that includes outdoor travel), this is a great program.

My wife, by the way, refuses to complete the quest until she is sure there is another adventure for her to move on to.

Acheron and Upper Apshai

For those of you who liked *Apshai*, the *Upper Reaches* may be enjoyable. It adds 150 new rooms, treasures, traps and hazards to the list of fun things for *Apshai* owners. That is, you must have *Temple of Apshai* to play this expansion unit, and *Hellfire Warrior* to play *Keys of Acheron*.

(For newcomers: your character will have strength, constitution, dexterity, intelligence, intuition, and ego. You can buy weapons, armor, magic items and more to visit the levels. You will see your character onscreen, and can control motion by typing R or L plus a number to signal the distance of the move. There are many fine details to these exciting games.)

Upper Reaches is about the adventures of those who arrived in *Apshai* too late to mine the mother lode. It offers the innkeeper's backyard, the magician Merlis's cottage, the dwarf Olias's cellar, and Benedic the priest's monastery.

While cleaning up the backyard, you are attacked by dogs, giant tomatoes, a farmer's wife, lots of mice, chickens, and other domestic critters.

Merlis has a covey of cats to deal with, bees, spiders, and other beasties.

Olias is often troubled by bats in his cellar, but that is where he stores the loot taken from the adventurers who died in the Temple. Arrows, armor, swords, elixir... all are here to be found.

The monastery offers the most challenge: the dead are walking here, and a vampire prowls the night.

These Automated Simulations games are very popular, and I note that the expansion kits are numbered "1." Apparently others are on the way.

I found an error on the loading instructions to *Keys of Acheron* for the Apple. After booting the DOS 3.2 *Hellfire* disk, you must enter your character's attributes, arms and armor, etc. When it asks what level you wish to enter, insert the *Acheron* disk and hit the level choice. BREAK IN 20050 will appear at this point, so type RUN DM.

This is a much deeper game than *Upper Reaches*, and much more dangerous for your character. No chickens or geese here; you are faced with four levels of everything from dragons to astral skulls.

Your quest is to find the four gems—emerald, amethyst, ruby and sapphire—known as the Keys of Acheron. Each gem is protected by dire beings, led by the demon lord Kronus.

You will be transported to the different levels by the wizard Abosandrus, but you must find the portals to make your way back.

First is the Abode of the Dragon, which you must face after obtaining an enchanted necklace from a unicorn. Next you visit the Temple in the Jungle, a primeval place populated by beasts and reptiles from before time. In the temple of the reptile Sserpa, protected by the Sserpa shaman, is the second key.

The Crystal Caves, in the heart of a dead volcano, contain the third key. You will meet piranhas, giant scorpions, and other strange cavern beings. Finally you reach the Shadowland of Kronus, a world shrouded in perpetual darkness. Here, in his citadel, you will find the last key...if you survive the kraken, wraiths, automatons, traps and hazards of this strange land, not the least hazardous of which is the unkillable Kronus himself.

These are some of the most popular adventure games around, and the expansion kits will add to their play value for quite some time to come. They are topnotch in concept and execution.

creative computing
SOFTWARE PROFILE

Name:
The Keys of Acheron (Expansion kit for Hellfire Warrior) and The Upper Reaches of Apshai (Expansion kit for Temple of Apshai)

Type: Graphic adventure

System: 48K Apple II with Applesoft in ROM, or II+, 3.2 Disk Drive; also available for TRS-80 Level II on cassette, 32K Level III on disk

Format: Disk and cassette
Language: Basic
Summary: Son (or daughter) of Hellfire meets the Temple chickens.

Price: $19.95

Manufacturer:
Automated Simulations
P.O. Box 4247
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CIRCLE 132 ON READER SERVICE CARD

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SOFTWARE PROFILE

Name: Dragon's Eye
Type: Graphic adventure
System: 48K Apple II with Applesoft in ROM, or II+, 3.2 Disk Drive
Format: Disk
Language: Basic
Summary: Fairly interesting quest, and good melee graphics, but too many elements of chance.
Price: $24.95
Manufacturer:
Automated Simulations
P.O. Box 4247
Mountain View, CA 94040

Dragon's Eye

Dragon's Eye is another game Automated Simulations has picked up from an outside company, as they did *Tuesday Morning Quarterback*. This one is from Southern Software, and was written by Robert Leyland.

The challenge is to find a magic amulet used by the Evil Necromancer to control time. Your character has 21 days in which to do so. (Weather varies the number of periods in a day. Superb weather gives dawn, morning, noon, afternoon, dusk and evening. Fine weather doesn't have evening. If it should be storming, you have just morning and afternoon. So, depending upon the weather, 21 days may not be very many moves.)

You begin by selecting a name and a shield (which becomes your character's body during melees). You can select among four swords, from great sword to scimitar.

You are given several spells to use during your search. These should be cast when the time is auspicious, i.e., when the magical wind is right. A Necromantic spell, for example shouldn't be cast when times are right for Divining.

You open on a map of the Seven Provinces, with your location at Fel City, right in the middle. Relying on your intuition (or the Locate Eye spell, if conditions are correct), you move up to one of the provinces.

Along the way, you will run across monsters from ghosts to skeletons, golems to arachnids, sabretooth tigers to dragons. These melees are the most interesting part of the game, I feel.

The screen shifts to show your character and the monster. If you are at a distance from it, you can use either a magic bolt or an arrow. You can see your character fire these—missed arrows even stick in the ground. Once you get close enough, sword ready, you can chop horizontally, smash downward, thrust, parry, or duck. You can leap toward and away from your adversary while you battle.

You will run across monsters from ghosts to skeletons, golems to arachnids, sabretooth tigers to dragons.

You must watch your character's strength and health while you fight. The more exhausting strokes will diminish your strength. And if you stop to take a vial of healthful fluid, you may get hurt.

When you are in a location (shown by number) you can examine, rest, or move cautiously, boldly, or normally. (The bold attract trouble, but are a little faster; the cautious avoid the monsters unless they choose to do otherwise.)

This is one of the few adventures I have come across that gives the player a score. It is based on monsters killed, treasures found (including the Dragon's Eye), and arrows, magic bolts, etc., retained.

The major problem with the game is the lack of continuity. Other games in the genre give you a continuing adventure. With this one, it's out and back in a certain number of moves.

Swordthrust

Oh, I wish Donald Brown had found some way to include graphics in these games of his. These are excellent solitaire text adventures, with some highly imaginative techniques. The master diskette, *The King's Testing Ground*, even asks what sex you are, so that it can react correctly. Bravo.

All are very well thought out games, although the master instruction book is a bit thick at times for the person who doesn't really care about the mathematics of battle.

Your character has hardiness, agility, charisma, left hand rating, and fatigue. As you continue, your parrying ability, armor and weapons expertise all increase.

In the Main Hall of the Free Rogues, you can buy weapons, learn magic spells, bank money, examine your characteristics and acquisitions, buy drinks, train to increase expertise, go on an adventure, or quit the game.

The King's Testing Ground even asks what sex you are.

creative computing
SOFTWARE PROFILE

Name:
Sword Thrust: Master Diskette "The King's Testing Grounds," "The Vampyre Caves," "The Kidnapper's Cove," and "The Case of the Sultan's Pearl."
Type: Text adventure
System: 48K Apple II with Applesoft in ROM, or II+, 3.3 Disk Drive
Format: Disk
Language: Basic
Summary: The first text adventure I've seen where characters can change and learn, get fatigued, etc. If only it had some graphics!
Price: $29.95 for Master Diskette, (required for others at $24.95)
Manufacturer:
CE Software
801 73rd St.
Des Moines, IA 50312

Shields and armor that you purchase lose hardiness after several battles, and may just fall off without warning.

As in regular text adventures, you are told what is happening. You see text descriptions of the rooms you are in, objects there, and the various ghoulies on location. You type in your instructions, such as GET, DROP, LOOK, READY, ATTACK, and FLEE.

At times, you will run across a being who will be friendly, or can be bribed into being friendly. The being will join you on your adventure. Remain aware, however, that its fondness for you can change, often under the most embarrassing and deadly of circumstances.

Your character can be encumbered (carrying treasure, for example), fatigued, or hurt. He can fumble and drop or break a weapon—even, in some cases, hit himself.

After a short introductory game on the Testing Ground, your character can't return to that particular scenario. Instead, you must advance to one of the other three adventures, which, naturally, are much tougher.

The Vampyre Caves is a case of love at first bite. The adventurer is bitten by the vampire, and turns into a vampire adventurer. To become human again, he must travel through the caves and find the secret doors. Don't go outside: you know what sunshine does to a vampire.

Kidnapper's Cove is your chance to rescue the ailing son of a rich Count. You must

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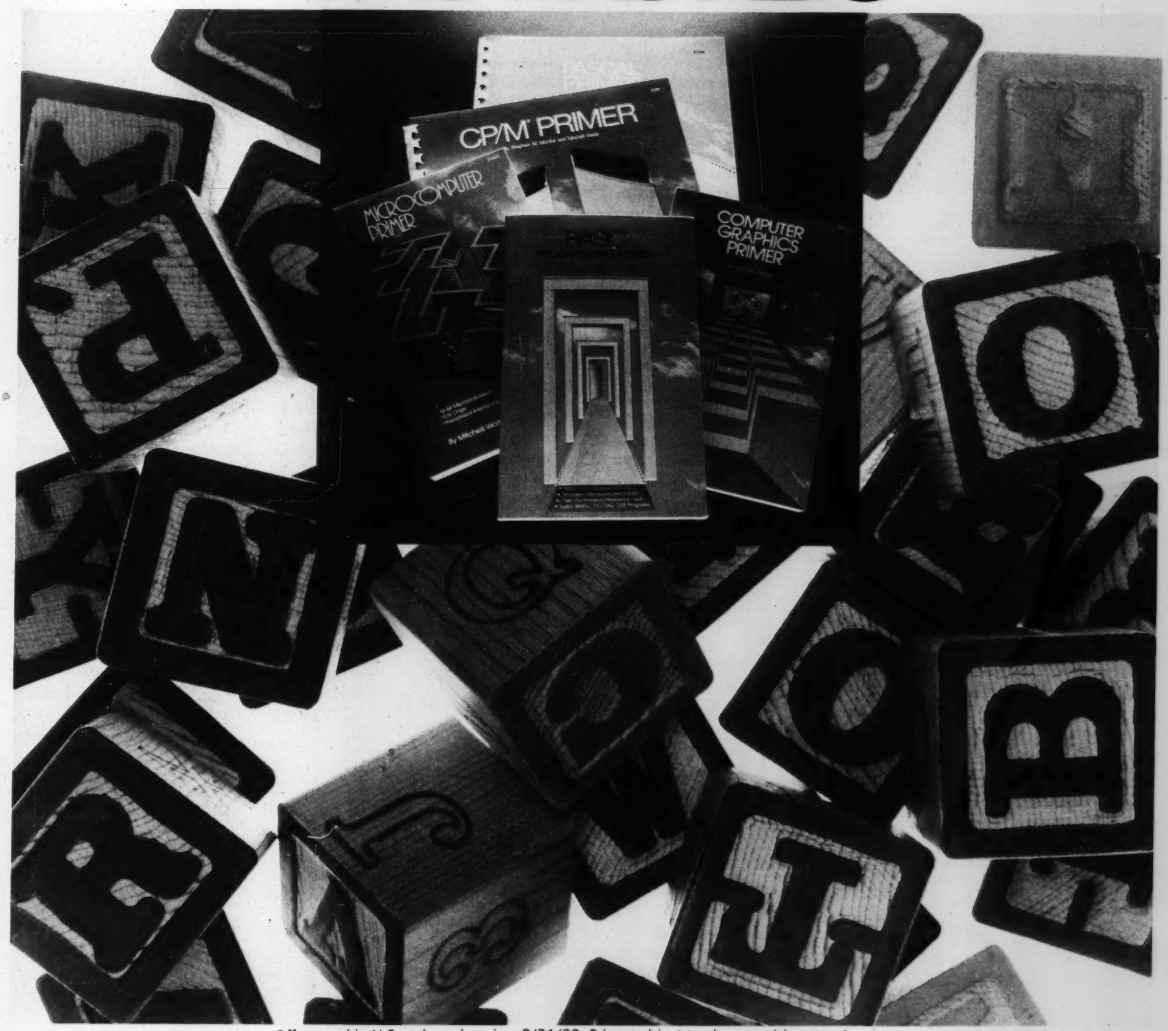

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CIRCLE 152 ON READER SERVICE CARD

deliver the ransom and a vial of the drug that will save the youngster's life.

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creative computing
SOFTWARE PROFILE

Name: Oo-topos
Type: Text adventure
System: 48K Apple II with Applesoft in ROM, or II+, 3.3 Disk Drive
Format: Disk
Language: Basic
Summary: A text adventure written by a science fiction writer.
Price: $32.95
Manufacturer:
Sentient Software
P.O. Box 4929
Aspen, CO 81612

Oo-Topos

Oo-Topos is another text adventure. It was written by Michael Berlyn who has published two science fiction books, *Crystal Phoenix* and *The Integrated Man*, both from Bantam.

The scenario is as follows: you were selected to petition the Galactic Council for a plague antidote, necessary to save the population of Earth. Your petition was granted, and you were asked to also deliver a shipment of valuables.

In your relief, you went out and partied until dawn, then shut off all automatic warning devices while you took a nap once the ship was aloft. This was the time the aliens chose to lock onto you with a tractor beam. They forced you to their planet, cracked open your ship, and locked you in a cell.

So, you must escape the cell, find your way out of the prison building, collect all your cargo, rebuild your ship, and soar back to Earth's space station.

If text adventures are your bag, you will probably enjoy this one. It is relatively straightforward, but Berlyn's imagination does add a few nice touches, and the descriptions are good.

Fantasyland 2041 AD

Fantasyland 2041 AD has some of the makings of an epic adventure *a la Ultima*, but it isn't my cup of chowder. It lacks variety, the graphics are simple, and you do not assume the role of the character. That is, you don't arm yourself, or engage in battle. You are simply the mastermind who decides in which direction your party should go, how to solve puzzles, etc. How can you identify with your character?

Fantasyland has much more than the average text adventure.

The challenge is to travel through jungle, desert, medieval England, a sea voyage across the Mediterranean, a submarine dip, and a visit to the Underworld to rescue either Lancelot or Guinevere (your choice). You will travel over 100 different terrains, and find a myriad of objects to help you.

Some of these objects will be useful in all terrains: food, for example. Other items will only be useful in one place. You won't need a plank or a shovel in a submarine, for example. At least, I don't think so. I haven't gotten that far.

You begin the adventure in the Hall of Heroes, with 5000 pieces of gold. There are various exhibits where you can buy items you will need for your expedition.

In the African exhibit, among other things, you can buy Zulu warriors' services, spears and blowguns. The Arabian exhibit has horses and samurai warriors in brass armor. The Medieval has knights, squires, archers and even peasant bearers. The Magic exhibit has such things as dragons, demons and zombies. The Nautical offers sailors, divers and harpooners, as well as a boat.

Once you have your group selected, you can begin your expedition. Your food will last a certain time depending upon the size of the party. If you have too many members, some will die. As you have problems and lose members, the others will have to carry the weapons and armor of the departed; at times you will be forced to drop some either temporarily or permanently.

As you travel, you will meet a variety of beings. These range from piranhas and apes to giant squid and dragons. There are numerous traps and pitfalls as well.

Every time you traverse a land successfully, you will be able to trade for new supplies. At least, you will until you reach the last two scenarios! Captain Nemo's underwater adventure, and Dante's Inferno.

I found one problem: When you are prompted to drop something temporarily, you are forced to drop it in front of you. At times a strategically-placed treasure may trap you and you must drop items permanently.

You can never go back through the gate once you have started your travels. Although you supposedly can save the game at any time, it seems that if you are killed at any point in the game, you are forced to start all over again.

I don't know what happens here, since with this particular copy of *Fantasyland*, I can't save a game. Every time I do, then ask to play an old game, it tells me to boot disk III, King Arthur. My figure ends up on the wrong side of a table in Merlin's lair.

creative computing
SOFTWARE PROFILE

Name: Fantasyland 2041 A.D.
Type: Graphic exploration
System: 48K Apple II with Applesoft in ROM, or II+, Disk Drive; 40K Atari 800, Basic cartridge, Disk
Format: Disk
Language: Basic and machine language
Summary: A set of six sides on three disks designed as a true epic outdoor/indoor adventure. I felt it was a fair game; others may go crazy over it.
Price: $59.95
Manufacturer:
Crystal Computer
17429 Bluejay Dr.
Morgan Hill, CA 95037

I also think they should use double-sided disks. These look like regular single-sided disks with a notch in them.

The Apple version of the game has 420 hi-res screens, plus some special ones. The Atari version has joystick control on land and in the ocean. Divers must be supplied with air and diving suits. They and the submarine are controlled by joystick.

It is indeed a supergame, with so many disks. For some people, it would be a fascinating way to spend a month or two.

The scenario and information-packed instruction book admits that this is a very difficult game. It isn't for the casual player. Instead, it is for the most dedicated player who enjoys the planning and thought that go into a text adventure with extra dimensions graphics can give. *Fantasyland* has much more than the average text adventure. □

Be sure to vote for your favorite software packages. See page 216.

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!Softlights

By Fred Huntington

Time for our latest new program for the Apple*, **Computer Almanac.** Written by David Carman, an honest-to-goodness weatherman, Computer Almanac is a diverse collection of well thought-out programs. It contains sunrise and sunset times, weather forecasts for any year, a wind chill chart, lightning safety rules, a super-duper extra easy to use loan amoritization program that will print out in 80 columns, health chapter (including a nifty calorie counter), a vacation planner, a biorythm chapter (needs printer) and more.

We're very proud of this program and think that at **$24.95**, it's one of the best bargains in the software market today. Also, don't forget our other new program for the Apple*, **Understand Yourself,** also **$24.95.** Dealer inquiries welcome.

Speaking of good programs, we'd like to recommend for either home or school use **Crossword Magic** by L&S Computerware. A super outstanding program with nothing else even close, we thought the original price of **$79.95** was a little steep. So we were able to convince them to lower it to **$49.95,** which is still a little steep for a crossword program, no matter how fantastic. So, to prove a point, we've set the price at **$39.99.** Now it's a bargain.

It will work with most graphic printers, including the Epson, with or without the Grappler.

GREAT GRANDMA HUNTINGTON

Great Grandma Huntington told me when I was a lad that I should always buy my computer media as a diskcount. She also said that a single density disk in the hand was better than a double density disk in the bush.

Great Grandma Huntington said a lot of things, many of which I can't remember. So we're having a contest to see who can come up with the best Great Grandma Huntington sayings. All entries must be postmarked no later than June 30, 1982 and should be addressed to:

GREAT GRANDMA HUNTINGTON
CONTEST
P. O. Box 787
Corcoran, CA 93212

The top two entries will receive genuine Epson LC Digital Quartz watches (yep, made by the same people who make those great printers). Winners will be used in future Softlights columns. All entries become the property of Huntington Computing and will not be returned. The worst ones may be used in future advertising.

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CIRCLE 144 ON READER SERVICE CARD

creative computing software evaluation

From Shovels to Lasers

Owen Linzmayer

If variety is the spice of life, then these reviews are full of it, *spice* that is. There is a review of *Apple Panic* for the Apple II, *Star Fighter* for the TRS-80 Models I and III, *Galactic Chase* for the Atari 400/800 and *Color Space Invaders* for the TRS-80 Color Computer. These are a few of the excellent software packages I have had the pleasure to evaluate recently. I hope you find something that strikes your fancy. I sure did—four of them. Have fun and good luck in the video wars.

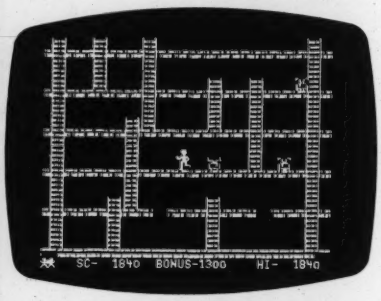
creative computing
SOFTWARE PROFILE

Name: Apple Panic
Type: Arcade game
System: 48K Apple II, II+
Format: Disk
Language: Machine
Summary: Excellent arcade game
Price: $29.95
Manufacturer:
Broderbund Software
2 Vista Wood Way
San Rafael, CA 94901

Take Me To Your Ladder

Climbing seems to be the rage in currently popular arcade games such as Crazy Climber, Donkey Kong and Space Panic. *Apple Panic*, from Broderbund Software, is an Apple adaption of Space Panic. Although the game appears to be simple, it is very challenging, not to mention nerve-wracking.

In *Apple Panic* the player controls a human equipped with only a shovel for defense. The man starts off on the bottom level of a six-platform maze interconnected by ladders of various lengths. The object is to kill the apple-monsters by digging holes in the brick ledges for them to fall into. To score, the player must wait for a monster to get stuck in a hole then smash it over the head with his shovel before it



Apple Panic.

crawls out. Finishing off a screen quickly is rewarded with bonus points, while slow thinking and hesitation bring death as the monster clamps onto the human's head and sucks its brains out—yuck! Sounds simple enough, but as the game progresses the monsters grow in number, speed and strength.

At the lower levels of the game only red apple-monsters infest the maze; at advanced levels green butterflies and Masks of Death appear. These must be bashed through two and three levels, respectively, to be killed. The trick here is to dig holes directly under one another. Luckily, the player may glide down levels unharmed by jumping in a hole. Normal physics don't apply here; instead of plummeting to his death like the evil monsters he is bent on destroying, he floats gently down to the next level.

Apple Panic is a well written program which uses hi-res color graphics and sound effects in a delightful combination to create a highly playable game. The only fault I could find with it is that when a monster is caught in a hole, some of the color "bleeds" onto the surrounding bricks. This doesn't affect the game itself, it just looks a bit messy. Other than that, I can find only good things to say about *Apple Panic*.

David Lubar, our resident Game Guru, assures me, in no way bragging, that the program doesn't crash after 220,560 points are achieved. *Apple Panic* has an intangible addictive quality that will keep young and old alike lined up at the keyboard waiting for their chance to "bash those little suckers."

creative computing
SOFTWARE PROFILE

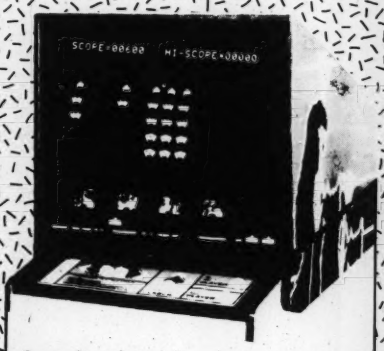
Name: Star Fighter
Type: Arcade/simulation
System: 16K cassette 32K disk TRS-80 Model I & II
Format: Cassette/Disk
Language: Machine
Summary: The best Star Trek/arcadish game I've seen
Price: $24.95 cassette $29.95 disk
Manufacturer:
Adventure International
Box 3435
Longwood, FL 32750

Star Trek Ver. 2198.36

"The world doesn't need another version of Star Trek." Well, maybe one more—*Star Fighter*. *Star Fighter* is much more than just another souped-up version of Star Trek for the TRS-80. It lies somewhere between Atari's *Star Raiders* and a high action arcade game. Quick thinking and nimble fingers are helpful in this game but one needs to act intelligently and responsibly if he intends to advance upwards in rank toward the coveted title of Star Lord.

Star Fighter is written in machine language by Sparky Starks and is sold by

THE creative computing software ARCADE

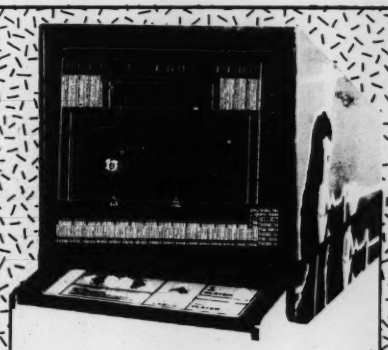


Super Invasion
Apple II (requires paddles)
licensed from Astar International
48K Diskette DOS 3.3 CS-4505 $19.95
16K Cassette CS-4006 $19.95
Sorcerer 16K Cassette CS-5011 $19.95
by Matt Hickey

This is the original arcade game, with superb high resolution graphics, high speed action, nail biting tension, and hilarious antics by the moon creatures. Fifty five aliens whiz across the screen, quickening their descent, challenging you to come out from behind your blockades and pick them off with your lasers before they bomb you, destroy your shields, or drop down right on top of you.

Super Invasion by John Varela
32K TRS-80 Model I Diskette CS-3520 $19.95
16K TRS-80 Cassette CS-3020 $19.95

A low resolution, high speed arcade game similar to our Apple and Sorcerer versions. The aliens move back and forth across the screen, dropping ever lower to attack you as you attempt to destroy them with your lasers.

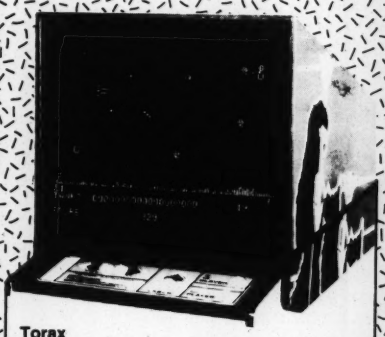


Blisterball and **Mad Bomber**
By Rodney McCauley
Apple II 48K Diskette DOS 3.3 (requires paddles) CS-4511 $24.95

A frantic, fast paced romp that can be played for hours, **Blisterball** is the first truly original arcade-type game for a home computer. As the bouncing balls drop from above, the player moves his laser base and tries to shoot them. It's easy at first—with just one ball. Then come two, then three. It's getting harder. Four balls come, and finally five. Surviving them, the player gets to shoot at inelastic bonus balls. If he makes it this far, the second round starts. The balls bounce lower, the walls close in. Shades of Poe and Newton! Making Superb use of Apple graphics and sound, **Blisterball** can be played by one or two people. **Mad Bomber**, included on the same disk, is another fast paced arcade game. Racks of bombs fill up above you. Whenever four bombs are in any rack, they start to fall. You can shoot them either in the rack or while they are falling, but since there are racks all across the top of the screen, you need to stay ahead of them to survive.

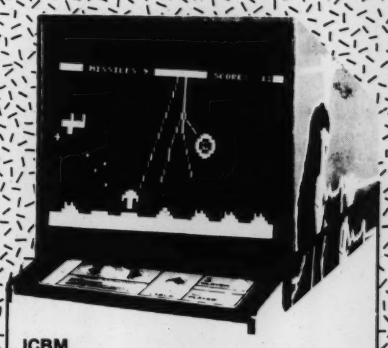
Tsunami
by Rodney McCauley
Apple II 48K Diskette DOS 3.3 (requires paddles) CS-4526 $29.95

Wave after wave of alien attackers attempt to overwhelm your defenses. Each wave comes in a different formation and uses different attack and defense strategies. You get dozens of superior arcade games combined into one program. If you ever master the first set of games on the diskette, where the attackers are without shields, then you are ready for the second set. This time the attackers are sheltered by shields. They can drop bombs right through the shields, but you cannot shoot through them. Successive waves use different strategies. Some move from shield to shield, allowing you to shoot while they are in between. Others just come out briefly to attack, and you must have fast reflexes to get them. Bonus points are awarded for beating the clock, with a countdown timer displayed on screen. This may be our finest arcade game ever!



Torax
by Erol Pekoz
Apple II 48K Diskette DOS 3.3 (requires paddles) CS-4520 $24.95

Defend your home planet against the invading Torids! Try to protect your nuclear fuel tanks, which the aliens are intent on stealing. The Torids drop down, steal a fuel tank and rise up to escape. They are also armed, and will not hesitate to shoot at you. While you whiz by the surface of your planet at incredible speed, you must avoid enemy fire, maneuver your ship, and try to shoot down the Torids without hitting the fuel tanks!



ICBM
Audio visual licensed from Atari, Inc.
32K TRS-80 Model I Diskette CS-3521 $19.95
16K TRS-80 Cassette CS-3021 $19.95

TRS-80 version of the popular arcade game where you must destroy incoming missiles with your own anti-ballistic missiles before they destroy your cities with nuclear warheads.

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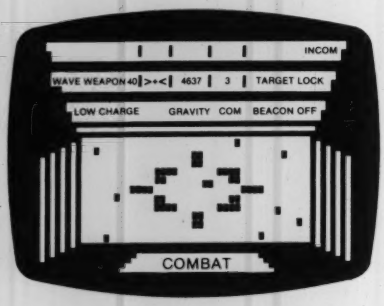
TRS-80 Sorcerer Apple II

Adventure International. There are three parts to this package, a training simulator program for beginners, a main mission program and an extremely detailed and somewhat awkward 33-page instruction booklet. The game itself is great—nothing less than excellent. The player starts out as a new recruit fighting for the Solar Galactic Authority against the Petro Resources Conglomerate. He flies, or rather hyper-drives through space in search of honor and wealth by destroying enemy PRC craft. He must be careful though; of the eleven different types of ships he could encounter, only six are valid targets. The others are friendly and will bring demotion if destroyed.



Star Fighter.

The realistic restrictions put on the pilot and the tense moments before battle are just two factors which make *Star Fighter* a program that outclasses anything in its field. Options available to the pilot are: send, request or kill beacon, enable wave or beam weapon, attempt to identify target, use peripheral vision, lock onto target, request tow, engage in combat or navigational mode, use extended scan, and hyper-drive to any of the infinite sectors of space or to one of the eight landbases. While at certain landbases the fighter may: receive an overhaul, refuel, buy tow tickets, collect bounty for ships destroyed, purchase hyper-recharge or have his performance reviewed for possible promotion.

It is variety—of options, restrictions, random encounters, space craft and high-speed graphics—that make *Star Fighter* a classic. It has been advertised as "The Penultimate Space War Game"; I hope that is because one more expanded deluxe version is in the works. Anyone who doesn't mind wading through the fine-printed documentation will find *Star Fighter* more than worth the asking price in terms of hours upon hours spent battling the forces of evil in the cosmos. Every game player should own this one; it is definitely a winner.

creative computing
SOFTWARE PROFILE

Name: Galactic Chase
Type: Arcade game
System: 16K Atari 400/800
Format: Cassette/Disk
Language: Machine
Summary: Fine Atari version of Galaxian
Price: $24.95 cassette $29.95 disk
Manufacturer:
Spectrum Computers
26618 Southfield
Southfield, MI 48076

Chasin' The Blues Away

From Spectrum Computers comes proof positive that Atari isn't the only source of quality arcade games for their 400/800 computer systems. *Galactic Chase* is an Atari home computer version of the immensely popular arcade game, Galaxian. It is Space Invanders with a twist; kamikaze aliens break out of formation from the convoy above and swoop down, following wild parabolic paths as they drop lethal bombs, intent on the player's destruction.

Galactic Chase is a colorful, fast-paced, shoot 'em up game written by Tony Weber. One or two players can compete, controlling their ships via the joysticks. This program has everything that the arcade game has; four different enemy ships, a high score function (doesn't save to disk), bonus star-ships, hi-res color graphics, beautiful sound effects, progressively harder levels of play and even aliens that do "U-turns in space."

Galactic Chase.

One feature that *Galactic Chase* has added to the game is a *magnetic repeller* situated on the nose-cone of the ship. As a last resort it sometimes becomes necessary to collide directly with an alien in the hopes that the repellers will destroy it. This comes in handy, but I wouldn't use it as an offensive weapon, I prefer the comfort of a warm laser cannon and a little more distance between the attackers and me.

Galactic Chase is a wonderful piece of machine language programming—in only 16K. The speed and action of the graphics make it a very compelling game. I highly recommend it to all Galaxian freaks, it is easily worth the price if you enjoy the challenge of an addicting arcade game.

creative computing
SOFTWARE PROFILE

Name: Color Space Invaders
Type: Arcade
System: 16K Extended Color Basic, TRS-80 Color Computer
Format: Cassette
Language: Machine
Summary: Very well done Space Invaders
Price: $21.95
Manufacturer:
Spectral Associates
141 Harvard Ave.
Tacoma, WA 98466

Annie, Get Your Laser

Color Space Invaders is just that, a Space Invaders program written for the TRS-80 Color Computer. Rather than regurgitate what Space Invaders is and how it is played, let's just say it is the grand-daddy of the arcade games.

The Spectral Associates version offers something not even the original Midway game has, multi-color graphics (PMODE 3). The sound effects are nice and the action is intense with sixteen different levels of play. The higher the level, the larger the laser base and the faster the aliens move. An attacking wave consists of 48 aliens in an eight-by-six arrangement that rains bombs down on the defender. Another novel item invented by Spectral Associates is a movable, indestructible shield that hovers above the blockades and absorbs enemy shots but allows friendly fire to pass onward and upward. The player can move and shoot at the same time, all with very smooth graphics.

Color Space Invaders is a very interesting Color Computer rendition of the original arcade game. The fast moving hi-res color graphics really demonstrate what the Color Computer can do. I look forward to seeing new action games from Spectral Associates. They seem to know what they are doing and if you do, you'll buy Color Space Invaders. It's a bargain at only $21.95. □

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CIRCLE 123 ON READER SERVICE CARD

Videotex for Learning?

Henry and Elizabeth Urrows

Question: Why does the U.S. lag in teaching via videotex?

Answer: Via *what*?

Videotex (no final *t*, please) is old stuff in England, a hot topic in Canada, government policy in France and Japan. In America it is still in the "please explain" stage.

Part of the confusion is all those names: videotex, teletext, viewdata, Ceefax, Oracle, Prestel, Antiope, Intelmatique, Captain, Viewtron, Gateway, Vista, among many others. The system is a lot simpler than its taxonomy.

Step one: Videotex is the catch-all name.

Step two: *One*-way videotex has the generic term teletext. Its brand names include Ceefax, Oracle, and Antiope. Ceefax was developed by the BBC in the early 1970s and since 1975 has continued as a full public service over broadcast channels BBC-1 and BBC-2. Oracle (Optional Reception of Announcements by Coded Line Electronics) began about the same time and is a regular service of the British Commercial Independent Broadcasting Authority. Antiope (Acquisition Numerique et Televisualisation d'Images Organisees en Pages d'Ecriture) has operated in France since the Paris Bourse (stock exchange) went on the air over the national TV network and is the teletext service in Paris and Lyon.

How one-way teletext works: a bit stream of digital data encodes alphanumeric and/or graphic images at a transmission rate the particular TV system can handle. The data are inserted or multiplexed on unused lines in the vertical blanking interval when scanning of the TV picture begins. These lines are at the top of the TV screen on part of the tube the cabinet hides and are not seen by viewers of regular programs. A decoder in or attached to the TV set accepts the data, stores one or more pages in buffer memory, and displays pages on the screen as summoned by the viewer on his keypad.

Step three: *Two*-way videotex has the generic term viewdata. Among brand names are British Telecom's Prestel, the French Titan which is compatible with Antiope, the Canadian Telidon which also comes in one-way teletext mode, Japan's Captain, the West German Bildschirmtext, Finnish Telset, and Dutch Viditel. The last three have built on, and are compatible with, the British Prestel.

How two-way viewdata works: Unlike broadcast teletext's continuous transmission of magazines that comprise up to 200 pages or frames, the viewdata terminal has a modem that converts an analog telephone (or other common carrier) signal into digital form for display.

Instead of pressing a keypad to get one or more of the pages that are continually rebroadcast, the viewdata retrieval device can be either a keypad or typewriter-like keyboard. It can summon from a computer-stored database of hundreds of thousands, or conceivably millions, of pages.

The computer software permits virtually instant access and screen display, rather than having to wait the 12 seconds customary on teletext. The software automatically tallies and bills users, and credits the electronic publishers who create and maintain pages in the central computer database.

It you think the teletext decoder has a microprocessor chip congruent with one that is in a low-cost small computer linked to a TV set, you can be right. If you infer that the program content offered on videotex has much in common with The Source and CompuServe, you are accurate. But those readers who remember Tracy R. Licklider's article "Calling Information: Telecomputing with Personal Computers" reprinted in the April, 1981 issue from *The Boston Computer Update* may have already decided that videotex is a lot easier to use. Videotex does not require the customer to learn computer language of any kind.

Step four: What has any of this to do with learning? Briefly, there is a hierarchy of information obtainable through com-

Henry and Elizabeth Urrows, Box 332, Ridgefield, CT 06877.

munications media. At the simplest end of the spectrum is casual information that has its limited uses in coping with ordinary needs: flight schedules, weather predictions, price of goods and services, news headlines. One step up is business information that enables an organization to function; when this information should not be available to viewers outside the enterprise or institution, it should be shared within a Closed User Group.

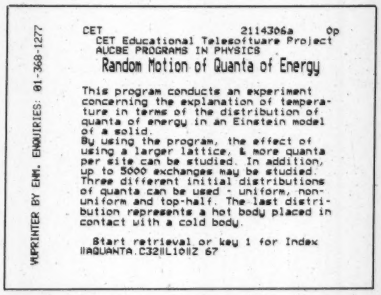
Then there is social information that specifies what particular government departments or offices, and specific agencies, do to serve specific needs.

Last is structured learning associated with schools, colleges, and distance or extension courses. This has defined objectives and should provide for feedback so the learner can find out what he has acquired in the way of skills, knowledge, and some understanding of what the content is about.

Let's regard the first two kinds of learning as the sort that people get through newspapers, magazines, directories, newsletters, professional and trade periodicals. They can also get this information via videotex more promptly than through print, more easily than by phone, and without needing to know Basic, Cobol or other special languages. The second two kinds of learning are those that government, educational institutions, and nonprofit organizations are in business to furnish. To show how videotex is being used for these varieties of learning, we give this quick comparative international report.

England

The BBC's Ceefax and ITA's Oracle are one-way teletext systems. In 1979 their "19 schools project" transmitted pages before and after the showings of such TV programs as "Exploring Science." These provided notes for teachers and reminded stu-


CET 2114306a Op
CET Educational Telesoftware Project
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This program conducts an experiment concerning the explanation of temperature in terms of the distribution of quanta of energy in an Einstein model of a solid.
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Start retrieval or key 1 for Index
IIAQUANTA.C32IL10IZ 67
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Hard copy made of Prestel introductory frame explaining a telesoftware program in physics and directing user to begin retrieving unless he wishes the Index to select another program. A code in the upper left identifies the service provider. In the center of the top line is the number of the frame accessed. The upper right corner has price—in this instance nothing.

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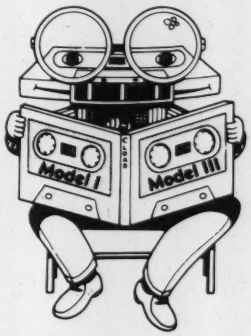

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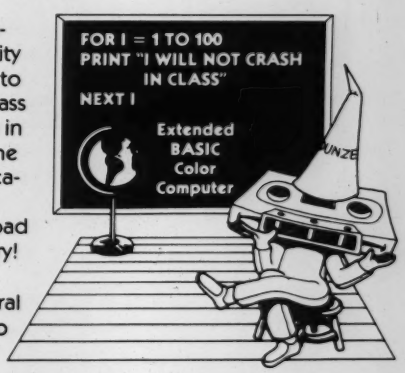

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CIRCLE 113 ON READER SERVICE CARD

dents of the main points of what they had seen or missed. One observer noted that "The experiments appear to have been successful, if unremarkable; one of the benefits being increased classroom discussion."

The U.K. Department of Industry furnished 32 schools with computer terminals and adapters to TV sets for a broader investigation of teaching and learning uses of British Telecom's two-way Prestel system.

A bank of programs is being made available so that Ceefax, Oracle, and Prestel can download materials which owners of small computers store to use when and as often as they wish. W. J. G. Overington coined the word *telesoftware* in 1977. Its original meaning was the broadcasting of computer programs over television to intelligent teletext terminals. Later it came to describe software transmission over the air and by cable and telephone lines in real-time from a computer system source to a computer which would execute the software. According to Mike Brown of the CET Prestel Educational Umbrella Service, because Prestel equipment and usage costs are too high for many schools, designers decided to create software that emulates a Prestel terminal on the Research Machines 380Z microcomputer that many schools and colleges in England have bought and are buying.

Microcomputers have nearly all the hardware needed in a Prestel terminal: a video display, keyboard, and communications interface. A modem or acoustic coupler is also needed to connect to the telephone line.

Software now in use takes three forms: cassette Prestel telesoftware for cassette-based computers furnish Prestel reception,

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Key 2 for Executive Summary
Key 8 for more American Reports
Key 9 for more European Reports

Prestel International went into regular service on July 1, 1981 in seven countries after one year of experimental development. This page gives a precis of Frost and Sullivan American and European reports. At 50p British currency (or about $1 U.S.) per frame, the information falls into the second category of learning in this article, and amounts to a small fraction of what Frost and Sullivan normally charges corporations for their research reports.

frame printouts, and retrieval of computer programs on cassettes; disc Prestel telesoftware for disc micros able to retrieve Prestel sub-trees and computer programs for which copyright clearance is obtained; and the integrated Viewdata system for disc-based micros with these features plus an editing terminal that creates and maintains local databases which absorb Prestel frames within their programs. The CET is designing identical software for other makes of micros and has expressed hope that Prestel will develop modem cards to decrease rental costs.

The CET estimates that the capital cost of this telesoftware system is about 13% of the price of a conventional Prestel terminal and that running costs are 17%, substantially reduced because of quick retrieval at lowest telephone and Prestel rates and because of successive re-uses at no cost at all.

A Political Task

The establishment of a national telesoftware service on Prestel is a political as well as technical task because it often involves conflicting interests of service providers, computer manufacturers, software producers, Prestel users, and Prestel itself. Apparently Gordian knots have been cut. Richard Hooper, Director of Prestel, assured us that current telesoftware programs on Prestel will increase in the near future.

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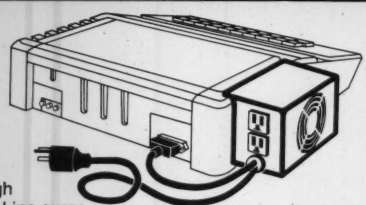

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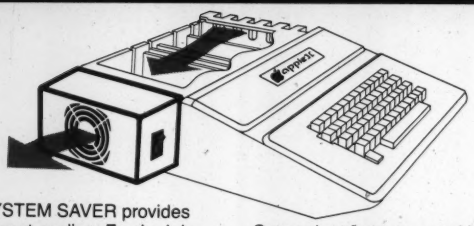

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CIRCLE 159 ON READER SERVICE CARD

For cynics who say videotex is a solution in search of a problem, proponents cite Britain's Open University, which had real problems that the new medium is helping meet. The OU began in late 1969. Its 45,000 graduates are one-twelfth of all U.K. university alumni and have fully accredited world-recognized degrees. Most of its 65,000 undergraduate students are working adults who study in their spare time and take six to ten years to complete a degree course.

The curriculum includes TV and radio programs that leaven specially written texts, limited face to face contact with instructors at 255 study centers, and week-long summer schools for the more "practical" courses. TV is popular with students, but when the number of course options exceeded 130 in 1980 so did the number of programs aired without repeats and put on at inconvenient hours.

Cyclops

In 1977 a research team from OU's Math and Technology faculties worked with its educational technology division to develop Cyclops, first as a low-cost A-V teaching system using ordinary TV sets for both display and audio outputs. It enabled students to store and replay AV programs from standard audio cassettes, with pictures coded as a sequence of audio tones. Audio cassettes are cheaper than videocassettes, which are too big to fit in most British mail boxes, and audio cassette recorders are cheaper and in wider use than VCRs.

The group devised a remote blackboard which has modems connecting two tape replay units by telephone. It allows teacher and student to communicate orally while drawing on their TV screens with a light-pen.

Cyclops also uses a keypad to access frames stored by the OU in the Prestel database. Because the original Prestel display format was designed for science and technology education, having few mathematical symbols and no Greek characters along with effective resolution of 72 x 80 for graphics, the Cyclops terminal was developed, and is now comparable to Level 2 of the British teletext standard. The Cyclops terminal has graphic resolution of 240 x 320 and a repertoire of symbols which totals 256 characters.

Since mid-1979 the OU has collaborated with Aregon International on research and development. A medium resolution alphageometric coding model which can display at the same time advanced alphamosaic and alphaphotographic graphics has been designed and put into use. There is also an inexpensive microcomputer-based studio system for creating, changing and recording picture data which has made production runs of the inexpensive color graphics Cyclops terminal based on the Motorola 6800.

The replay device has a 16K byte input buffer. It permits storage of a complex or slow-to-display picture sequence in advance of its commentary. Cyclops is also capable of executing telesoftware loaded down-line from cassette, micro or main frame computer, viewdata system or over the telephone network.

Social Information

In Britain on Prestel the Association of Special Libraries and Information Bureaux has conducted an experiment in social information, supplying answers to questions on welfare, employment, leisure interests, and where to find counseling for particular needs. The British Library supplies reference, loan, catalog, and online retrieval services. The national government Central Office of Information, Central Statistical Office, Lord Chancellor's Office, the Meteorological Office, Ministry of Agriculture, Fisheries and Food, departments of the Environment, Industry, and Trade, Overseas Trade Board and Parliament all use Prestel to answer questions on consumer rights, current prices, and their particular functions. These can save time otherwise spent travelling to the offices and save toll charges from locations throughout the U.K. and northern Ireland.

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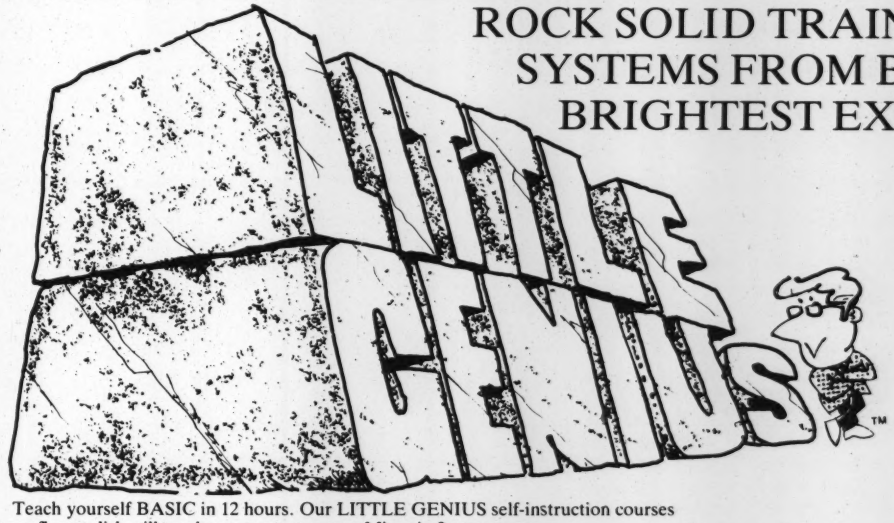

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Local government bodies—Brighton and Bournemouth for their tourist attractions; the Essex County and Glasgow District councils, and the London boroughs of Bromley, Hounslow, Richmond Upon Thames, and Waltham Forest to tell about their community services, clubs, societies and organizations—disseminate public information. Because small district councils felt they could not spare money from their budgets to pay for Prestel charges, in Hertfordshire ten of them joined together to form one service providership, rented out pages to local businesses, and cleared enough to pay for the community service they wanted.

In mid-1981 only two countries, Britain and Finland, had full public videotex services in operation.

In mid-1981 only two countries, Britain and Finland, had full public videotex services in operation. All the others are testing. The U.K. has 150,000 terminals in use for which customers pay. Once a resident has a decoder, Ceefax and Oracle come free. In April 1981 there were 10,500 subscribers to Prestel, with a ratio of eight business users to each residence. They paid not only for their TV sets and adapters, but also for the local phone calls and for those pages on which there are access charges.

Canada

In April 1979 the Canadian federal government Department of Communications began its four-year $10 million development of Telidon. This videotex system has been tooling up ever since, and started its first trials in May 1981.

Starting in October 1980 TV Ontario piggybacked Telidon teletext on the television programs it sent by ANIK-B 12/14 GHz satellite transponder to the isolated town of Quetico near the Manitoba border. Since then it has transmitted a Telidon magazine to Quetico by way of the same satellite along with regularly scheduled TV programs. This project, run by the Ontario Educational Communications Authority (OECA), has been sending teletext to 55 terminals throughout Ontario by broadcast and telephone transmission.

John H. Syrett, the Telidon and Education project manager for TV Ontario, has written a chapter for the "Technology and Teaching" volume in the **New Directions for Teaching and Learning** series being published by Jossey-Bass. In it he asks us to consider a scenario in which Mary Future, age 18, works at an assembly plant in a small town. She left school at 17 for the sake of a steady income, but is "confident that she did not have to give up her further education . . . . Her confidence arose from the certain knowledge that part of every day could be devoted to completing those undergraduate courses she had not completed in school, or to proceeding with a choice of post-graduate courses. Her employer makes available to her a videotex terminal for eight hours a week, and encourages the taking of applied arts courses that have a bearing on Mary's growth as a skilled employee."

Syrett describes the terminal that plugs into a TV set and says that "With the flick of a switch, Mary can send messages to similar terminals in other offices or retrieve information originating with her tutor at a college 80 miles distant. At home, Mary has access to a similar terminal . . . . If Mary has some research to do, she can do a free text search of any one of several databases. If she wishes to assess her progress in a particular course unit, she can instruct the data base at the school to display an objective test. When her responses are complete, she is presented with her score and some recommendations for further study to correct deficiencies revealed in the process."

Peter G. Bowers, general manager of OECA operations, and Dr. Maria L. Cioni gave a paper on Telidon and Education in Canada. Their agency's distinction, they said, is that it "is one of very few agencies undertaking to develop educational applications for videotex in a major way . . . we are the only agency to our knowledge that is attempting to develop both interactive and broadcast modes in an integrated way."

They termed the OECA field trial a "composite experiment" that consists of four parts: (a) broadcast, (b) interactive, with participation in (c) the Bell Vista and (d) cable Telidon trials. They said 55 terminals operating in both interactive and broadcast modes will be deployed in schools, colleges, universities, libraries, science museums, and homes.

"The initial aim will be to expose educational information providers to the system," Bowers and Cioni explained, "and encourage them to create educational content." OECA considers, they wrote, Telidon "to be an educational medium in its own right" because of several characteristics:

"Hypothetically, at least, Telidon could be as ubiquitous as television sets or telephones. It has, therefore, the potential of delivering educational experiences to anyone, regardless of location or time." Its interactive capability allows each learner to proceed at his own pace with periodic feedback on progress. (How is this different from what small computers offer? Presumably the eventual universality.) Its graphics make possible music scores, charts and graphs, symbols, equations, cartoons, and maps.

They project using Telidon (in ascending order of complexity) as a complement to educational TV; as an alternative to conventional print (on which the OECA now spends $500,000 a year ("with the price of newsprint going up, postal rates going up and distribution times getting longer, electronic publishing becomes more interesting")); for dissemination of educational information (particularly when Ontario weather closes schools and stops school buses), and less crucial but still useful facts on curriculum, registrations, job openings, and for tests which they translate into pedagogical jargon as "appraisal instruments."

Telidon could be as ubiquitous as television sets or telephones.

Climbing to more complex uses they foresee videotex retrieving information from data banks and interactive learning programs. These involve individually paced correspondence courses with keyed-in responses to tests, computer assisted learning, computer managed learning using ETV to present materials, educational quizzes and games, and (finally) course content, exams, answers, results, and diploma.

Grouped among applications "that appear to be within the capability of the technology but that are not developed" are Telidon with audio, telesoftware, full channel transmission, alphabetic keyboards, hard copy printers and addressable terminals, and what is called "common video space." They say audio would enhance the medium, that "with voice synthesizers we could even dispense with the visual display of text. However, we are not advocating this. Obviously work would have to be done on the tradeoffs between information capacity devoted to audio and that devoted to data . . . "

T. Ranald Ide, chairman of the Canadian government's Communications Research Advisory Board (CRAB) who was CEO of the Ontario Educational Communications Authority from 1970 to 1979 and is given credit for the growth and success of TV Ontario, gave his view of what the future should bring in a paper distributed at Videotex '81.

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"Literacy," he said ought to include the ability to think critically, not only about what is in print but also what is heard, what is seen on television or displayed on a computer." (BBC has begun to telecast its series designed to encourage computer literacy.)

Ide continued, "It is particularly important to know where organized knowledge is stored and how to access it and evaluate its worth. If educational systems of the future fail to provide for these requirements then we will inevitably become the victims rather than the beneficiaries of the emerging technologies. Both the content of the curriculum and the form of the educational system will have to be re-examined in the light of the new developments in science and technology."

His conclusion has vision, identifying videotex and other participatory media as having an important potential. "Interactive devices offer unheard of opportunities for life-long learning," he wrote. "The contents of millions of books and journals will be almost instantly accessible at the press of a button. The great teachers will be there, even though electronically, to provoke and stimulate, and everyone ought to be able to afford them. Equal opportunity to learn is no longer only an unrealizable ideal."

The possibility of economic barriers is implicit in his statement that everyone *ought* to be able to afford the great teaching. And it will be a while before it is on-line; from what we could learn, the Canadians have not yet put their Telidon videotex system to work on reportable educational applications.

Interactive devices offer unheard of opportunities for life-long learning.

Telidon's technical distinction is primarily in innovative graphics that use alphageometric coding with Picture Description Instructions that program certain point, line, arc, rectangle, and polygon geometric primitives and their location, dimensional, and color characteristics.

At Videotex '81 in Toronto on May 20, 1981 the Canadians were very enthusiastic when AT&T announced its videotex standard, termed Program Level Protocol, and stated that it was compatible with Telidon.

Little of this concerns using videotex for learning. But Canada was discussing it, and Canadian educators were voicing their misgivings lest Telidon turn out to be a mixed bag in terms of broad public interest and concern.

France

In "Videotex: The Race to Plug In" written for a special March 1981 supplement to *ComputerWorld*, Elizabeth M. Ferrarini told how in 1976 French President Valery Giscard d'Estaing authorized Inspector General Simon Nora of the Ministry of Finance to report on the impacts of computer technology on French society. The resulting January 1978 report to d'Estaing, published in the book *Computerization of Society*, became the basis of the grandiose French plan to integrate into one system teletext, viewdata, and telephone directory assistance terminals. France has set out aggressively to export 30% of its telecommunications equipment by the end of 1982, and plans to invest $27 billion during the next five years to become the "Charlemagne of the wired nations."

The high point of the French national telephone system plan is the distribution of an electronic telephone directory assistance terminal to every telephone user in the country. Instead of looking up a number in a printed directory, the French will use a video display terminal with a typewriter keyboard to access phone numbers. In May 1981 the national phone company ordered 300,000 black-and-white terminals from four manufacturers.

As Ferrarini puts it, "the French believe that 30 million terminals distributed within the next 10 years will be cheaper than printing and distributing both the white and yellow pages of the telephone directory for that period. At present it costs about $230 million a year to print telephone books. Although the proposed directory assistance terminals will cost less than $100 apiece users will have to pay a tariff on the calls they make." About 20% of the French population has telephones now, and the goal is 80% by 1990.

Education seems virtually absent as a factor, except in one respect: the national Ministry of Education plans to make using a keyboard compulsory for all French school pupils. The trial in 2500 households in five communities southwest of Paris does not plan to place any Teletel (the name for the national viewdata service based on Antiope, France's videotex system) terminals in schools.

Japan

The first experimental service of Captain (Character and Pattern Telephone Access Information Network) ran in Tokyo with 199 information providers and 976 terminals from December 1979 to March 1981. A second trial begins in August.

Unlike all other viewdata systems about which we have been able to learn thus far, from the start Captain contained lessons aimed at kindergarten through junior high users. With a database capacity of 100,000 frames, it began with 14,081 out of 98,944 frames classified as "education and culture," renewing 12,996 of them in the course of the first trial. Up through March 15, 10.36% of the 9,836,000 frame accesses were education and culture.

The second pre-market trial service will have 200,000 frames and 2000 terminals in Tokyo. It has alphaphotographic coding which displays as many as 4000 different characters in Kanji (Chinese), the Katakana syllabary, the cursive Hiragana, Roman alphanumerics and special symbols. The Ministry of Posts and Telecommunications recently announced that full commercial service will begin in 1983.

The French will use a video display terminal with a typewriter keyboard to access phone numbers.

In their report at Toronto, Susumu Harashima and Tadashu Kitamura of the NTT Engineering Bureau stated that NTT continues investigation and development of hybrid code and pattern transmission, connection to digital transmission display of a more finely detailed picture and "new services, such as telesoftware."

Venezuela

Hector Martinez, head of the Venezuelan government's office of Statistics and Information, told Videotex '81 that it has put into operation 22 Telidon terminals in ten orientation and information centers and five libraries in Caracas, primarily to let illiterate and barely literate citizens know what government services are available.

He explained that "there is no intention of mechanizing the process of questions and answers to the public; on the contrary, the intention is to establish a link between the public in need of information and individuals specially trained to determine exactly the need of the person who comes to put the question . . . Videotex is a tool to support the orienter, but it is also a source of attraction to the public, with its colorful display."

The government is the information provider and all data are free. It has cost less than $1 million for start-up. A dozen people work three four-hour shifts at six editing terminals creating 150 pages per day. Priorities are emergency social services involving hospital and medical care services, financial and employment needs,

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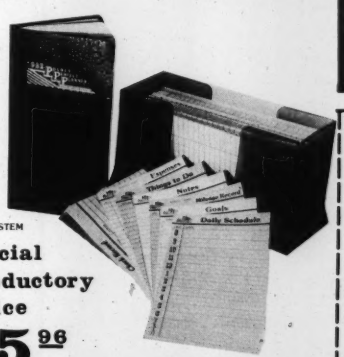

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CC-1

The first frame of the Academic American *encyclopedia article on particle accelerators, taken by Polaroid from the face of a CRT screen at Arete Publishing Co.*

followed by education on careers, school and university admissions, the cultural area, and tourist information.

By the end of 1982 there should be 70 information centers with videotex terminals to furnish staff with updated facts for citizens in various parts of Venezuela and service should be extensive in Caracas when the Pan American games are held there in 1983. The fourth stage, a commercial service run by the telephone company, is planned for 1984.

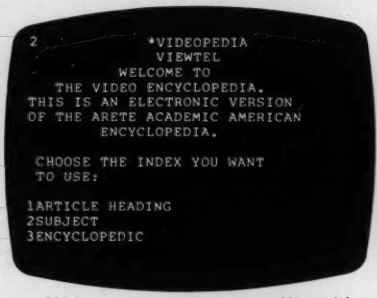
The U.S.

In April 1981 Thomas D. Harnish reported on the viewdata test the Online Computer Library Center conducted during the last three months of 1980 in 200 Columbus, OH homes by attaching decoders to ordinary TV sets.

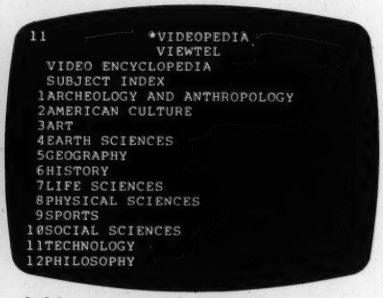
The test used library catalog and encyclopaedia databases created automatically (by using special OCLC software) from machine-readable records provided by the Columbus and Franklin County Public Library and the Arete Publishing Company in Princeton, NJ. Users searching the library catalog by author, title, or subject had access to 300,000 records corresponding to books and other materials held by the main library and its branches. Arete's *Academic American* Encyclopedia was accessed by its 200,000 keyword index, 32,000 article titles, or classified menu according to discipline or subdiscipline. Articles varied in length from a single frame to over 300 TV screen "pages." Illustrations and graphics had to be omitted.

The Ohio State University College of Education developed two educational services tested during the project. "Math That Counts" provided exercises for teaching children basic mathematics, with problem sets grouped by grade level from kindergarten through sixth grade. "Early Reader," designed to help parents teach preschool children to read and recognize word relationships, had 14 single-screen rhymes and instructions to parents on their use.

These six frames show the tree structure of the Arete Academic American *encyclopedia whose 32,000 article database was on-line during the October-December 1980 OCLC Channel 2000 trial in Dayton, OH. Our April 1981 issue reprinted Bill Streeter's article from the November 1980* ABA Bankind Journal *which illustrated rudimentary electronic banking demonstrated during the experiment with 200 households. It told how one-third of the encyclopedia articles are updated annually. About one-tenth of the nine million words (about 82 million characters stored on nine-track magnetic tape) is revised in any one month.*

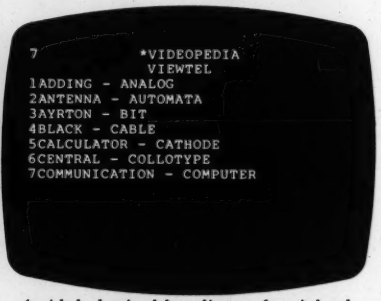


1. Welcome to new users, offers title, subject, or index.



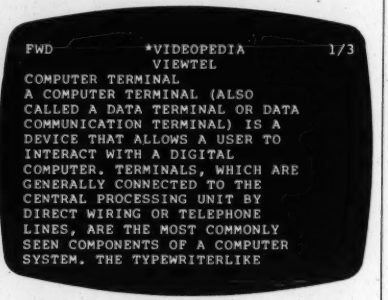
2. Menu page of Subject files.

3. The result of pressing 11 on screen 2.



4. Alphabetical headings of articles by title.

5. The result of choosing 7 on screen 4.



6. The first of several frames telling what a computer terminal does.

In the evaluation of the project, users found the videotex services enabling them to look up their checking account balances, pay bills, and consult the encyclopedia easiest to use, and the two instructional offerings most difficult.

When asked to rank the services according to the likelihood they would pay money to have them in their homes, users ranked the encyclopedia and library catalog first and second, and the instruction courses last.

Harnish found that more than a few users were bothered by the absence of the audio signal to which they are accustomed when watching a TV screen. The New York Times Information Service now makes available Arete's *Academic American* database on CRT display and paper printouts to subscribers. In England the *New Caxton Encyclopaedia* has 10,000 condensed articles on Prestel, with "entries particularly suitable for children's homework and projects."

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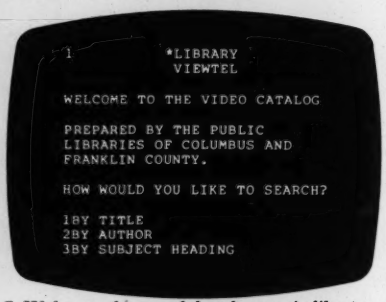
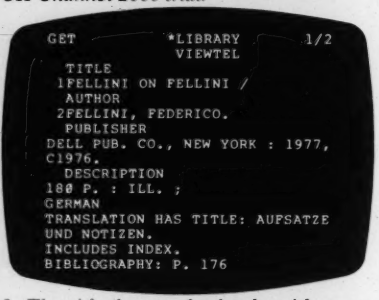


7. Welcome frame of the electronic library catalog OCLC offered in its Columbus, OH Channel 2000 trial.



8. The title frame of a book, with cross reference to different title of its German translation.

Perspective

Richard Hooper, director of Prestel, told the Videotex '81 banquet audience that videotex with Gateway facilities to third party databases moves the goal posts and changes the rules of the game. "Gateway will be seen by future historians as an inspired response by videotex systems to the attack from on-line computer systems moving downmarket. Gateway permits large numbers of people to look at large numbers of pages. Videotex can now aspire to being encyclopaedic."

Gateway was developed by the West German developers of *Bildschirmtext*, with the help of British consultants. It enables a user to access host databases directly without having to be confined by the storage limitations of a central computer. Now Prestel is licensing it back from the German Deutsche Post and planned to put Gateway into service in early 1982, with 120 companies queued up for its use. At Toronto the Germans announced that *Bildschirmtext* will go into full public service in 1983.

Even though AT&T has issued what it says will be a North American standard which will not be compatible with European databases unless the latter transcode, as far as the free flow of scholarly as well as all other kinds of data go it will be desirable for a worldwide standard to emerge, taking into account the creative ferment represented by British, German, French, Canadian, Japanese and all other contributions to the state-of-the-art. From what we can see, use of videotex for education has been largely talked about rather than demonstrated, except for the landfalls cited earlier.

Conclusion

Education tends to get the crumbs from the table where business goes out after paying mass and special markets. KCET, a PBS station in Los Angeles, has an interesting trial applying CBS-modified French Antiope teletext. The able investigators, at last report, were out hunting for the $500,000 still needed for their trial.

While conglomerates and multinational corporations, and entire national PTTs backed by their governments, invest heavily, the educators must do what they can by stretching meager resources. Perhaps it was always thus, but can we continue to have learning given low priority now? □

Videotex Update

Prestel was officially launched as a commercial service in the U.S. on January 19, 1982 from its Boston-based computer center.

"The Boston computer center allows U.S. users and information providers to access Prestel's 210,000 page database via a local telephone call over Telenet, as well as giving U.S. corporations the opportunity to become operators of their own videotex service on proven systems at very low cost," said William Shrimpton, president of BVT, the marketing organization for British Videotext and Teletext technology.

For the Boston launch, terminals made by Zenith and decoders made by Wolfdata and Radofin were used. Floppy disk software converting an Apple II to Prestel was also on display. This hardware is available to U.S. users, ranging in price from $85 for the Apple disk to $1,250 for the Zenith terminal.

More than 15,000 users worldwide are currently connected to the Prestel service, most of them business users. Some 900 information providers, including American Express, Holiday Inn Hotels, Frost & Sullivan, Merrill Lynch, Newsweek and the Official Airlines Guide are using Prestel as an electronic publishing and message transmission medium. Prestel also allows users to order goods and services from their terminals, and is being tested as a direct-marketing tool for information providers.

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CARD GAMES

NEW

BACCARAT (Atari only) — **Price: $18.95 Cassette/$22.95 Diskette**
This is the European card game which is the favorite of the Monte Carlo jet set. Imagine yourself at the gaming table with 007 to your left and Goldfinger to your right. Learn and play BACCARAT at your leisure on the Atari. Contains full high resolution color graphics and matching sound. Runs in 16K. Requires one joystick.

NEW

GIN RUMMY (Apple only) — **Price: $18.95 Cassette/$22.95 Diskette**
This is the best micro computer implementation of GIN RUMMY existing. The computer plays exceptionally well, and the HIRES graphics are superb. What else can be said?

POKER PARTY (Available for all computers) — **Price: $17.95 Cassette/$21.95,Diskette**
POKER PARTY is a draw poker simulation based on the book, POKER, by Oswald Jacoby. This is the most comprehensive version available for microcomputers. The party consists of yourself and six other (computer) players. Each of these players (you will get to know them) has a different personality in the form of a varying propensity to bluff or fold under pressure. Practice with POKER PARTY before going to that expensive game tonight! Apple cassette and diskette versions require a 32 K (or larger) Apple II.

NEW

GO FISH (Available for all computers) — **Price: $14.95 Cassette/$18.95 Diskette**
GO FISH is a classic children's card game. The opponent is a friendly computer with user inputs that are simple enough for small children to easily master. The Apple and Atari versions employ high resolution graphics for the display of hands. A must for children!

THOUGHT PROVOKERS

MANAGEMENT SIMULATOR (Atari, North Star, OSBORNE and CP/M only) — **Price: $19.95 Cassette $23.95 Diskette**
This program is both an excellent teaching tool as well as a stimulating intellectual game. Based upon similar games played at graduate business schools, each player or team controls a company which manufacturers three products. Each player attempts to outperform his competitors by setting selling prices, production volumes, marketing and design expenditures etc. The most successful firm is the one with the highest stock price when the simulation ends.

FLIGHT SIMULATOR (Available for all computers) — **Price: $17.95 Cassette/$21.95 Diskette**
A realistic and extensive mathematical simulation of take-off, flight and landing. The program utilizes aerodynamic equations and the characteristics of a real airfoil. You can practice instrument approaches and navigation using radials and compass headings. The more advanced flyer can also perform loops, half-rolls and similar aerobatic maneuvers. Although this program does not employ graphics, it is exciting and very addictive. See the software review in COMPUTRONICS. Runs in 16K Atari.

VALDEZ (Available for all computers) — **Price: $15.95 Cassette/$19.95 Diskette**
VALDEZ is a computer simulation of supertanker navigation in the Prince William Sound/Valdez Narrows region of Alaska. Included in this simulation is a realistic and extensive 256 x 256 element map, portions of which may be viewed using the ship's alphanumeric radar display. The motion of the ship itself is accurately modelled mathematically. The simulation also contains a model for the tidal patterns in the region, as well as other traffic (outgoing tankers and drifting icebergs). Chart your course from the Gulf of Alaska to Valdez Harbor! See the software reviews in 80 Software Critique and Personal Computing.

BACKGAMMON 2.0 (Atari, North Star, OSBORNE and CP/M only) — **Price: $14.95 Cassette/$18.95 Diskette**
This program tests your backgammon skills and will also improve your game. A human can compete against a computer or against another human. The computer can even play against itself. Either the human or the computer can double or generate dice rolls. Board positions can be created or saved for replay. BACKGAMMON 2.0 plays in accordance with the official rules of backgammon and is sure to provide many fascinating sessions of backgammon play.

CHESS MASTER (North Star and TRS-80 only) — **Price: $19.95 Cassette/$23.95 Diskette**
This complete and very powerful program provides five levels of play. It includes castling, en passant captures and the promotion of pawns. Additionally, the board may be preset before the start of play, permitting the examination of "book" plays. To maximize execution speed, the program is written in assembly language (by SOFTWARE SPECIALISTS of California). Full graphics are employed in the TRS-80 version, and two widths of alphanumeric display are provided to accommodate North Star users. See review in onComputing.

NEW

SUPER SUB CHASE (Atari only) — **Price: $19.95 Cassette/$23.95 Diskette**
SUPER SUB CHASE simulates a search and destroy mission. Set your course and keep an eye on the sonar readings as you hunt for the hidden submarine. Set the depth charge explosion depth and watch them sink towards the nub. This is an addictive game which takes advantage of the Atari's graphics and sound capabilities. One or two players. Joystick(s) required.

FOREST FIRE! (Atari only) — **Price: $15.95 Cassette/$19.95 Diskette**
Using excellent graphics and sound effects, this simulation puts you in the middle of a forest fire. Your job is to direct operations to put out the fire while compensating for changes in wind, weather and terrain. Not protecting valuable structures can result in startling penalties. Life-like variables are provided to make FOREST FIRE! very suspenseful and challenging. No two games have the same setting and there are 3 levels of difficulty.

BLACK HOLE (Apple only) — **Price: $14.95 Cassette/$18.95 Diskette**
This is an exciting graphical simulation of the problems involved in closely observing a black hole with a space probe. The object is to enter and maintain, for a prescribed time, an orbit close to a small black hole. This is to be achieved without coming so near the anomaly that the tidal stress destroys the probe. Control of the craft is realistically simulated using side jets for rotation and main thrusters for acceleration. This program employs Hi-Res graphics and is educational as well as challenging.

NEW

SPACE EVACUATION! (Apple, Atari and TRS-80 only) — **Price: $15.95 Cassette/$19.95 Diskette**
Can you colonize the galaxy and evacuate the Earth before the sun explodes? Your computer becomes the ship's computer as you explore the universe to relocate millions of people. This simulation is particularly interesting as it combines many of the exciting elements of classic space games with the mystery challenge of ADVENTURE.

MONARCH (Atari only) — **Price: $11.95 Cassette/$15.95 Diskette**
MONARCH is a fascinating economic simulation requiring you to survive an 8-year term as your nation's leader. You determine the amount of acreage devoted to industrial and agricultural use, how much food to distribute to the populace and how much should be spent on pollution control. You will find that all decisions involve a compromise and that it is not easy to make everyone happy. Runs in 16K Atari.

CHOMPELO (Atari only) — **Price: $11.95 Cassette/$15.95 Diskette**
CHOMPELO is really two challenging games in one. One is similar to NIM; you must bite off part of a cookie, but avoid taking the poisoned portion. The other game is the popular board game REVERSI. It fully uses the Atari's graphics capability, and is hard to beat. This package will run on a 16K system.

SPACE LANES (Available for all computers) — **Price: $10.95 Cassette/$14.95 Diskette**
SPACE LANES is a simple but exciting space transportation game which involves up to four players (including the computer). The object is to form and expand space transportation companies in a competitive environment. The goal is to amass more net worth than your opponent. The economics include stock purchases and company mergers. Watch your wealth grow!

AVAILABILITY

DYNACOMP software is supplied with complete documentation containing clear explanations and examples. Unless otherwise specified, all programs will run within 16K program memory space (ATARI requires 24K). Except where noted, programs are available on ATARI, PET, TRS-80 (Level II) and Apple (Applesoft) cassette and diskette as well as North Star single density (double density compatible) diskette. Additionally, most programs can be obtained on standard (IBM 3740 single density/double density compatible format) 8" CP/M floppy disks for systems running under MBASIC (for example, Altos, Xerox 820 and many others). 5¼" CP/M diskettes are available for the North Star and Osborne computer systems.

**ATARI, PET/CBM, NORTH STAR, CP/M, IBM, OSBORNE and XEROX are registered tradenames and/or trade marks.*

***Except where noted, all TRS-80 Model I software is available on cassette (only) for the TRS-80 Model III. Exceptions: VALDEZ, CRIBBAGE, GRAFIX, CHESSMASTER. TRS-80 diskettes are not supplied with either DOS or BASIC.*

****For most North Star disk-based systems. DYNACOMP presently does not support the new North Star Advantage.*

*****For Altair systems having Microsoft BASIC.*

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NEW

STARTREK 3.2 (Available for all computers) — **Price: $11.95 Cassette/$15.95 Diskette**
This is the classic Startrek simulation, but with several new features. For example, the Klingons now shoot at the Enterprise without warning while also attacking starbases in other quadrants. The Klingons also attack with both light and heavy cruisers and move when shot at! The situation is hectic when the Enterprise is besieged by three heavy cruisers and a starbase S.O.S. is received! The Klingons get even! See the software reviews in A.N.A.L.O.G., 80 Software Critique and Game Merchandising.

NEW

LIL' MEN FROM MARS (Atari only) — **Price: $19.95 Cassette/$23.95 Diskette**
Defend yourself! The little men from Mars are out to get you if you don't get them first. This is a hilarious high resolution animated graphics (arcade) game which exercises much of the Atari's power. Requires one joystick.

SPACE TILT (Apple and Atari only) — **Price: $10.95 Cassette/$14.95 Diskette**
Use the game paddles to tilt the plane of the TV screen to "roll" a ball into a hole in the screen. Sound simple? Not when the hole gets smaller and smaller! A built-in timer allows you to measure your skill against others in this habit-forming action game.

NEW

ESCAPE FROM VOLANTIUM (Atari only) — **Price: $15.95 Cassette/$19.95 Diskette**
Bring the action and excitement of an arcade into your home with ESCAPE FROM VOLANTIUM! To escape you must maneuver your space ship around obstacles and laser blast the dragon (without being eaten). If he is killed with a direct shot (not just a leg lopped off), a door opens to the outside. However, the door does not stay open indefinitely. If you fail to escape in time, the door closes and a new dragon appears. Sometimes you can smash through the door by repeatedly chipping away at it. Other times it is impervious. At the higher levels of play more obstacles and dragons appear, adding to the excitement. Uses high resolution graphics and sound. Runs in 16K.

ALPHA FIGHTER (Atari only) — **Price: $13.95 Cassette/$17.95 Diskette**
Two excellent graphics and action programs in one! ALPHA FIGHTER requires you to destroy the alien starships passing through your sector of the galaxy. ALPHA BASE is in the path of an alien UFO invasion; let five UFO's get by and the game ends. Both games require the joystick and get progressively more difficult the higher you score! ALPHA FIGHTER will run on 16K systems.

THE RINGS OF THE EMPIRE (Atari only) — **Price: $15.95 Cassette/$19.95 Diskette**
The empire has developed a new battle station protected by rotating rings of energy. Each time you blast through the rings and destroy the station, the empire develops a new station with more protective rings. This exciting game runs on 16K systems, employs extensive graphics and sound and can be played by one or two players.

INTRUDER ALERT (Atari only) — **Price: $15.95 Cassette/$19.95 Diskette**
This is a fast paced graphics game which places you in the middle of the "Dreadstar" having just stolen its plans. The droids have been alerted and are directed to destroy you at all costs. You must find and enter your ship to escape with the plans. Five levels of difficulty are provided. INTRUDER ALERT requires a joystick and will run on 16K systems.

NEW

MIDWAY (Atari only) — **Price: $14.95 Cassette/$18.95 Diskette**
MIDWAY is an exciting extension of the game of Battleship. It mixes the challenges of strategy and chance. Your opponent can be another human or the computer. Color graphics and sound are both included. Runs in 16K.

TRIPLE BLOCKADE (Atari only) — **Price: $14.95 Cassette/$18.95 Diskette**
TRIPLE BLOCKADE is a two-to-three player graphics and sound action game. It is based on the classic video arcade game which millions have enjoyed. Using the Atari joysticks, the object is to direct your blockading line around the screen without running into your opponent(s). Although the concept is simple, the combined graphics and sound effect lead to "high anxiety".

GAMES PACK I (Available for all computers) — **Price: $10.95 Cassette/$14.95 Diskette**
GAMES PACK I contains the classic computer games of BLACKJACK, LUNAR LANDER, CRAPS, HORSERACE, SWITCH and more. These games have been combined into one large program for ease in loading. They are individually accessed by a convenient menu. This collection is worth the price just for the DYNACOMP version of BLACKJACK.

GAMES PACK II (Available for all computers) — **Price: $10.95 Cassette/$14.95 Diskette**
GAMES PACK II includes the games CRAZY EIGHTS, JOTTO, ACEY-DUCEY, LIFE, WUMPUS and others. As with GAMES PACK I, all the games are loaded as one program and are called from a menu. You will particularly enjoy DYNACOMP's version of CRAZY EIGHTS.

Why pay $7.95 or more per program when you can buy a DYNACOMP collection for just $10.95?

MOON PROBE (Atari and North Star only) — **Price: $11.95 Cassette/$15.95 Diskette**
This is an extremely challenging "lunar lander" program. The user must drop from orbit to land at a predetermined target on the moon's surface. You control the thrust and orientation of your craft plus direct the rate of descent and approach angle. Runs in 16K Atari.

SPACE TRAP (Atari only, 16K) — **Price: $14.95 Cassette/$18.95 Diskette**
This galactic "shoot'em up" arcade game places you near a black hole. You control your spacecraft using the joystick and attempt to blast as many of the alien ships as possible before the black hole closes about you.

NEW

CHIRP INVADERS (PET/CBM only) — **Price: $14.95 Cassette/$18.95 Diskette**
CHIRP INVADERS is an addictive game using action graphics. A Federation space station must be reached before the Chirps conquer the Earth. Stationary obstacles, moving meteors, and the attacking Chirps must all be avoided for a successful journey. Good luck.

ADVENTURE

CRANSTON MANOR ADVENTURE (North Star and CP/M only) — **Price: $19.95 Diskette**
At last! A comprehensive Adventure game for North Star and CP/M systems. CRANSTON MANOR ADVENTURE takes you into mysterious CRANSTON MANOR where you attempt to gather fabulous treasures. Lurking in the manor are wild animals and robots who will not give up the treasures without a fight. The number of rooms is greater and the associated descriptions are much more elaborate than the current popular series of Adventure programs, making this game the top in its class. Play can be stopped at any time and the status stored on diskette. Not available in 5¼" CP/M format.

GUMBALL RALLY ADVENTURE (North Star only, 48K) — **Price: $21.95 Diskette**
Take part in this outlaw race from the east coast to the west coast. The goal is to find your way to the finish line while maintaining the highest possible speed. You may choose one of five cars available at the garage. The choice will affect your speed and range. Remember to take spare parts and don't get caught speeding!

NEW

UNCLE HARRY'S WILL (North Star only, 40K) — **Price: $24.95 Diskette**
Uncle Harry has died and has left you everything. However, he has neglected to mention where everything is! Instead, his will consists of a poem which contains clues. You will have to travel all over the United States both by car and on foot to solve the puzzle, and there are over 300 locations to probe. Be careful and watch out for red herrings!

SPEECH SYNTHESIS

DYNACOMP is now distributing the new and revolutionary TYPE-'N-TALK™ (TNT) speech synthesizer from Votrax. Simply connect TNT to your computer's serial interface, enter text from the keyboard and hear the words spoken. TNT is the easiest-to-program speech synthesizer on the market. It uses the least amount of memory and provides the most flexible vocabulary available anywhere!

List price $375. DYNACOMP'S price $319.95 plus $5.00 for shipping and handling.

TALK TO ME (T'N'T Atari only, 24K) — **Price: $14.95 Cassette/$18.95 Diskette**
This program presents a superb tutorial on speech synthesis using the Atari 800 and TYPE 'N TALK™. TALK TO ME will illustrate normal word generation as well as phoneme generation. The documentation includes many helpful programming tips. TALK TO ME has been demonstrated on network (CBS) TV!

MISCELLANEOUS

CRYSTALS (Atari only) — **Price: $ 9.95 Cassette/$13.95 Diskette**
A unique algorithm randomly produces fascinating graphics displays accompanied with tones which vary as the patterns are built. No two patterns are the same, and the combined effect of the sound and graphics are mesmerizing. CRYSTALS has been used in local stores to demonstrate the sound and color features of the Atari. Runs in 16K Atari.

NORTH STAR SOFTWARE EXCHANGE (NSSE) LIBRARY
DYNACOMP now distributes the 23 volume NSSE library. These diskettes each contain many programs and offer an outstanding value for the purchase price. They should be part of every North Star user's collection. Call or write DYNACOMP for details regarding the contents of the NSSE collection.

Price: $9.95 each/$7.95 each (4 or more)
The complete collection may be purchased for $149.95

BUSINESS and UTILITIES

NEW

MAILMASTER (Atari diskette only) — **Price: $39.95 Diskette**

MAILMASTER is a very versatile software package for managing and manipulating mail lists and mini data bases. Each disk can hold over 700 customer entries containing name, address, three 3-letter key words and a phone number. The display is marked so that entries may be made and edited with ease. The status (e.g., disk space left, options, etc.) is shown at all times. Labels may be printed 1,2 or 3 up, and all sorting (zip code and alphabetic) is performed by a fast machine language program.

PERSONAL FINANCE SYSTEM (Atari and North Star only) — **Price: $39.95 Diskette**

PFS is a single diskette, menu-oriented system composed of ten different programs. Besides recording your expenses and tax deductible items, PFS will sort and summarize expenses by payee, and display information on expenditures by any of 26 user defined codes by month or by payee. PFS will even produce monthly bar graphs of your expenses by category! This powerful package requires only one disk drive, minimal memory (24K Atari, 32K North Star) and will store up to 600 records per disk (and over 1000 records per disk by making a few simple changes to the programs). You can record checks plus cash expenses so that you can finally see where your money goes and eliminate guesswork and tedious hand calculations. Contains high speed machine language sort. PFS has been demonstrated on network (CBS) TV!

FAMILY BUDGET (Apple and Atari only) — **Price: $34.95 Diskette**

FAMILY BUDGET is a very convenient financial record-keeping program. You will be able to keep track of cash and credit expenditures as well as income on a daily basis. You can record tax deductible items and charitable donations. FAMILY BUDGET also provides a continuous record of all credit transactions. You can make daily cash and charge entries to any of 21 different expense accounts as well as to 5 payroll and tax accounts. Data are easily retrieved giving the user complete control over an otherwise complicated (and unorganized!) subject.

INTELINK (Atari only) — **Price: $49.95 Diskette**

This software package contains a menu-driven collection of programs for facilitating efficient two-way communications through a full duplex modem (required for use). In one mode of operation you may connect to a data service (e.g., The SOURCE or Mic roNet) and quickly load data such as stock quotations onto your diskette for later viewing. This greatly reduces "connect time" and thus the service charge. You may also record the complete contents of a communications session. Additionally, programs written in BASIC, FORTRAN, etc. may be built off-line using the support text editor and later "up-loaded" to another computer, making the Atari a *very* smart terminal. Even Atari BASIC programs may be uploaded. Further, a command file may be built off-line and used later as controlling input for a time-share system. That is, you can set up your sequence of time-share commands and programs, and the Atari will transmit them as needed; batch processing. All this adds up to saving both connect time and your time.

TEXT EDITOR II (CP/M) — **Price: $29.95 Diskette/$33.45 Disk**

This is the second release version of DYNACOMP's popular TEXT EDITOR I and contains many new features. With TEXT EDITOR II you may build text files in chunks and assemble them for later display. Blocks of text may be appended, inserted or deleted. Files may be saved on disk/diskette in right justified/centered format to be later printed by either TEXT EDITOR II or the CP/M ED facility. Futher, ASCII CP/M files (including BASIC and assembly language programs) may be read by the editor and processed. In fact, text files can be built using ED and later formatted using TEXT EDITOR II. All in all, TEXT EDITOR II is an inexpensive, easy to use, but very flexible editing system.

NEW

PAYFIVE (Apple II plus diskette, two drives required) — **Price: $149.95**

This is an enormously flexible employee payroll system with extraordinarily good human engineering features. PAYFIVE prints checks and compiles the required federal, state and local forms for up to 148 employees. The pay methods may be hourly, salary, commission or any combination. There are multiple options for pay periods, and they also can be used in any combination. PAYFIVE includes *many* other features and comes extremely well documented with a 200 page manual. The manual may be purchased separately for $30, and that payment later applied to the software purchase.

SHOPPING LIST (Atari only) — **Price: $12.95 Cassette/$16.95 Diskette**

SHOPPING LIST stores information on items you purchase at the supermarket. Before going shopping, it will remind you of all the things you might need, and then display (or optionally print) your shopping list and the total cost. Adding, deleting, changing and storing data is very easy. Runs with 16K.

TAX OPTIMIZER (North Star only) — **Price: $89.95 Diskette**

The TAX OPTIMIZER is an easy-to-use, menu oriented software package which provides a convenient means for analyzing various income tax strategies. The program is designed to provide a quick and easy data entry. Income tax is computed by all tax methods (regular, income averaging, maximum and alternate minimum tax). The user may immediately observe the tax effect of critical financial decisions. TAX OPTIMIZER has been thoroughly field tested in CPA offices and comes complete with the current tax tables in its data files. TAX OPTIMIZER is tax deductible!

NEW

UTIL (Apple only, 48K) — **Price: $19.95 Diskette**

UTIL is a disk-oriented utility system which permits examining and changing of the contents of DOS 3.2 and 3.3 diskettes at the bit (nibble or byte) level. With UTIL you can easily examine the contents of a diskette sector by sector, restructure the sector pointers, reallocate sectors (e.g. bad sectors may be "hidden"), and perform many other sophisticated operations. For the experienced programmer.

NEW

TURNKEY AND MENU (Atari only) — **Price: $17.95 Diskette**

TURNKEY is a utility program which allows you to create autoboot/autorun diskettes easily. Simply load and run TURNKEY, load the program diskette to be modified, and answer the questions! The TURNKEY diskette also comes with DOS 2.0 and includes another program, MENU. MENU lists the contents of your diskette alphabetically, and permits the running of any BASIC program on the diskette by typing a single key. TURNKEY and MENU provide you with the ability to run any program on your diskette by simply turning on the computer and pressing a single key.

NEW

STOCKAID (Atari only) — **Price: $29.95 Diskette**

STOCKAID provides a powerful set of tools for stock market analysis. With STOCKAID you can display point and figure charts, as well as bar charts with oscillators. You can also examine long term moving averages and on-balance volume features. STOCKAID allows you to input daily data with a single diskette storage capability of 239 days × 16 stocks. Included are stock dividend and split adjustment capabilities. A very professional package!

NEW

SHAPE MAGICIAN (Apple II, 48K, diskette only) — **Price: $29.95**

At last! An utility for painlessly creating graphics shapes for the Apple. Create, edit and save up to 30 shapes which can then be used to develop arcade games or to simply enhance your programs. Add that professional touch!

EDUCATION

HODGE PODGE (Apple only, 48K Applesoft or Integer BASIC) — **Price: $14.95 Cassette/$18.95 Diskette**

Let HODGE PODGE be your child's teacher. Pressing any key on your Apple will result in a different and intriguing "happening" related to the letter or number of the chosen key. The program's graphics, color and sound are a delight for children from ages 1½ to 7. HODGE PODGE is a non-intimidating teaching device which brings a new dimension to the use of computers in education. See the excellent reviews of this very popular program in INFOWORLD and SOFTALK.

TEACHER'S AIDE (Atari only) — **Price: $13.95 Cassette/$17.95 Diskette**

TEACHER'S AIDE consists of three basic modules contained in one program. The first module provides addition and subtraction exercises of varying levels of difficulty. The second module consists of multiplication problems in which the student may be tested both on the final answer and/or on the subtotal answers in the long hand procedure. Several levels of complexity are provided here as well. The third module consists of division problems; one particularly nice feature of the division module is that the long hand division steps can be displayed along with the remainder in order to clearly demonstrate the procedure by which the remainder is derived. Using TEACHER'S AIDE is not merely a drill, but rather a learning experience.

PHARMACOLOGY UPDATE (PET only) — **Price: $149.95 Cassette/$153.95 Diskette**

This is DYNACOMP's first educational software entry for the medical profession (more are coming!). PHARMACOLOGY UPDATE was written by a R.N. as a masters project, with the aid of a practicing pharmacologist and an electronics instructor. This package comes in two parts. The first part is a 200 page manual which is divided into 10 sections. Each of these sections provides both concise information and probing questions. The second part consists of 10 programs that are keyed to the text and which test the degree of your understanding of the text material. This package has great educational value for the beginning student as well as the professional interested in an efficient way to review and update his or her knowledge.

ORDERING INFORMATION

All orders are processed and shipped within 48 hours. Please enclose payment with order and include the appropriate computer information. If paying by VISA or Master Card, include all numbers on card. Purchase orders accepted.

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5¼" CP/M Disks
All software available on 8" CP/M disks is also available on 5¼" disks, North Star and Osborne format.

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STATISTICS and ENGINEERING

DIGITAL FILTER (Available for all computers) — **Price: $39.95 Cassette/$43.95 Diskette**

DIGITAL FILTER is a comprehensive data processing program which permits the user to design his own filter function or choose from a menu of filter forms. The filter forms are subsequently converted into non-recursive convolution coefficients which permit rapid data processing. In the explicit design mode the shape of the frequency transfer function is specified by directly entering points along the desired filter curve. In the menu mode, ideal low pass, high pass and bandpass filters may be approximated to varying degrees according to the number of points used in the calculation. These filters may optionally also be smoothed with a Hanning function. In addition, multi-stage Butterworth filters may be selected. Features of DIGITAL FILTER include plotting of the data before and after filtering, as well as display of the chosen filter functions. Also included are convenient data storage, retrieval and editing procedures.

DATA SMOOTHER (Not available for Atari) — **Price: $19.95 Cassette/$23.95 Diskette**

This special data smoothing program may be used to rapidly derive useful information from noisy business and engineering data which are equally spaced. The software features choice in degree and range of fit, as well as smoothed first and second derivative calculation. Also included is automatic plotting of the input data and smoothed results.

FOURIER ANALYZER (Available for all computers) — **Price: $19.95 Cassette/$23.95 Diskette**

Use this program to examine the frequency spectra of limited duration signals. The program features automatic scaling and plotting of the input data and results. Practical applications include the analysis of complicated patterns in such fields as electronics, communications and business.

TFA (*Transfer Function Analyzer*) — **Price: $19.95 Cassette/$23.95 Diskette**

This is a special software package which may be used to evaluate the transfer functions of systems such as hi-fi amplifiers and filters by examining their response to pulsed inputs. TFA is a major modification of FOURIER ANALYZER and contains an engineering-oriented decibel versus log-frequency plot as well as data editing features. Whereas FOURIER ANALYZER is designed for educational and scientific use, TFA is an engineering tool. Available for all computers.

HARMONIC ANALYZER (Available for all computers) — **Price: $34.95 Cassette/$38.95 Diskette**

HARMONIC ANALYZER was designed for the spectrum analysis of repetitive waveforms. Features include data file generation, editing and storage/retrieval as well as data and spectrum plotting. One particularly unique facility is that the input data need not be equally spaced in order. The original data is sorted and a cubic spline interpolation is used to create the data file required by the FFT algorithm.

FOURIER ANALYZER, TFA and HARMONIC ANALYZER may be purchased together for a combined price of $49.95 (three cassettes) and $59.95 (three diskettes).

REGRESSION I (Available for all computers) — **Price: $19.95 Cassette/$23.95 Diskette**

REGRESSION I is a unique and exceptionally versatile one-dimensional least squares "polynomial" curve fitting program. Features include very high accuracy; an automatic degree determination option; an extensive internal library of fitting functions; data editing; graphical and residual plotting; a statistical analysis (eg. standard deviation, correlation coefficient, etc.) and much more. In addition, new fits may be tried without reentering the data. REGRESSION I is certainly the cornerstone program in any data analysis software library.

REGRESSION II (PARAFIT) (Available for all computers) — **Price: $19.95 Cassette/$23.95 Diskette**

PARAFIT is designed to handle those cases in which the parameters are imbedded (possibly nonlinearly) in the fitting function. The user simply inserts the functional form, including the parameters (A(1), A(2), etc.) as one or more BASIC statement lines. Data, results and residuals may be manipulated and plotted as with REGRESSION I. Use REGRESSION I for polynomial fitting, and PARAFIT for those complicated functions.

MULTILINEAR REGRESSION (MLR) (Available for all computers) — **Price: $34.95 Cassette/$38.95 Diskette**

MLR is a professional software package for analyzing data sets containing two or more linearly independent variables. Besides performing the basic regression calculation, this program also provides easy to use data entry, storage, retrieval and editing functions. In addition, the user may interrogate the solution by supplying values for the independent variables. The number of variables and data size is limited only by the available memory.

REGRESSION I, II and MULTILINEAR REGRESSION may be purchased together for $51.95 (three cassettes) or $63.95 (three diskettes).

ANOVA (Not available on Atari cassette or for PET/CBM) — **Price: $39.95 Cassette/$43.95 Diskette**

In the past the ANOVA (analysis of variance) procedure has been limited to the large mainframe computers. Now DYNACOMP has brought the power of this method to small systems. For those conversant with ANOVA, the DYNACOMP software package includes the 1-way, 2-way and N-way procedures. Also provided are the Yates 2^K-P factorial designs. For those unfamiliar with ANOVA, do not worry. The accompanying documentation was written in a tutorial fashion (by a professor in the subject) and serves as an excellent introduction to the subject. Accompanying ANOVA is a support program for building the data base. Included are several convenient features including data editing, deleting and appending.

BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2 (Not available for Atari)

DYNACOMP is the exclusive distributor for the software keyed to the popular texts *BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2* by F. Ruckdeschel (see advertisements in BYTE magazine). These subroutines have been assembled according to chapter. Included with each collection is a menu program which selects and demonstrates each subroutine.

Volume 1
Collection #1: Chapters 2 and 3 - Data and function plotting; complex variables and functions.
Collection #2: Chapter 4 - Extended matrix and vector operations.
Collection #3: Chapters 5 and 6 - Random number generators (Poisson, Gaussian, etc.); series approximations.
Price per collection: $14.95 Cassette/$18.95 Diskette
All three collections are available for $39.95 (three cassettes) and $49.95 (three diskettes).

Volume 2
Collection #1: Chapter 1 - Linear, polynomial, multidimensional, parametric least squares.
Collection #2: Chapter 2 - Series approximation techniques (economization, inversion, reversion, shifting, etc.).
Collection #3: Chapter 3 - Functional approximations by iteration and recursion.
Collection #4: Chapter 4 - CORDIC approximations to trigonometric, hyperbolic, exponential and logarithmic functions.
Collection #5: Chapter 5 - Table interpolation, differentiation and integration (Newton, LaGrange, splines).
Collection #6: Chapter 6 - Methods for finding the real roots of functions.
Collection #7: Chapter 7 - Methods for finding the complex roots of funcuons.
Collection #8: Chapter 8 - Optimization by steepest descent.
Price per collection: $14.95 Cassette/$18.95 Diskette
All eight collections are available for $99.95 (eight cassettes) and $129.95 (eight diskettes).
Because the texts are a vital part of the documentation, *BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2* are available from DYNACOMP:

BASIC SCIENTIFIC SUBROUTINES, Vol 1 (319 pages): $19.95 + 75¢ postage
BASIC SCIENTIFIC SUBROUTINES, Vol 2 (790 pages): $23.95 + $1.50 postage

See reviews in KILOBAUD and Dr. Dobbs.

NEW

SOFTNET (Apple II 48K, diskette only) — **Price $129.95**

SOFTNET may be used to create models of liquid pipeline systems to evaluate their flow performance. Up to 150 nodes with up to 150 connecting elements may be simulated, and models may be combined to form yet larger models. If you are involved in water distribution systems, chemical fluid flow problems, building plumbing, or similar situations, this is an ideal analysis tool.

ACTIVE CIRCUIT ANALYSIS (ACAP) (48K Apple only) — **Price: $25.95 Cassette/$29.95 Diskette**

ACAP is the analog circuit designer's answer to LOGIC SIMULATOR. With ACAP you may analyze the response of an active or passive component circuit (e.g., a transistor amplifier, band pass filter, etc.). The circuit may be probed at equal steps in frequency, and the resulting complex (i.e., real and imaginary) voltages at each component juncture examined. By plotting the magnitude of these voltages, the frequency response of a filter or amplifier may be completely determined with respect to both amplitude and phase. In addition, ACAP prints a statistical analysis of the range of voltage responses which result from tolerance variations in the components. ACAP is easy to learn and use. Simply describe the circuit in terms of the elements and their placement, and execute. Circuit descriptions may be saved onto cassette or diskette to be recalled at a later time for execution or editing. ACAP should be part of every circuit designer's program library.

LOGIC SIMULATOR (Apple only; 48K RAM) — **Price: $34.95 Cassette/$38.95 Diskette**

With LOGIC SIMULATOR you may easily test your complicated digital logic design with respect to given set of inputs to determine how well the circuit will operate. The elements which may be simulated include multiple input AND, OR, NOR, EXOR, EXNOR and NAND gates, as well as inverters, J-K and D flip-flops, and one-shots. The response of the system is available every clock cycle. Inputs may be clocked in with varying clock cycle lengths/displacements and delays may be introduced to probe for glitches and race conditions. At the user's option, a timing diagram for any given set of nodes may be plotted using HIRES graphics. Save your breadboarding until the circuit is checked by LOGIC SIMULATOR.

NEW

NUMBERKRUNCHER (TRS-80 only) — **Price: $49.95 Cassette/$73.95 Diskette**

This program is the most complete numerical analysis system available for the TRS-80. It can handle up to 255 data sets, each set having a six character name. It includes complete data editing facilities and convenient data input/output capability. The analyses available are multiple linear regression and correlation determination of residuals, data transformations and extensive graphics generation, including axis naming, and more. The supporting documentation is extremely well written and well organized, and includes appendices which describe the numerical procedures used in the program.

NEW

STATSORT (TRS-80 only) — **Price: $39.95 Cassette/$43.95 Diskette**

STATSORT consists of several menu selected programs which allow the user to create (build, edit, merge), format and print files, (machine) sort them on any field, and numerically analyze (maximum, minimum, average, variance, standard deviation) tabulated data. STATSORT is well documented and easy to use. The cassette version can also be employed to create a data type which can be read by the Radio Shack Advanced Statistical Package.

NEW

STATTEST (TRS-80 only) — **Price: $19.95 Cassette/$23.95 Diskette**

This is a statistical inference package which helps you make wise decisions in the face of uncertainty. In an interactive fashion you can build and edit data files and test the differences in means, variances and proportions. STATTEST will also perform data analysis as well as do linear correlation and regression. This menu-directed statistical workhorse is rounded out with a chi-square contingency test and a (uniform and normal) random sample generator. The documentation is written by a college professor who guides you through the various tests.

ABOUT DYNACOMP

DYNACOMP is a leading distributor of small system software with sales spanning the world (currently in excess of 50 countries). During the past three years we have greatly enlarged the DYNACOMP product line, but have maintained and improved our high level of quality and customer support. The achievement in quality is apparent from our many repeat customers and the software reviews in such publications as COMPUTRONICS, 80 Software Critique, A.N.A.L.O.G., Softalk, Creative Computing and Kilobaud. DYNACOMP software has also been chosen for demonstration on network television. Our customer support is as close as your phone. It is always friendly. The staff is highly trained and always willing to discuss products or give advice.

CIRCLE 136 ON READER SERVICE CARD

What's New for '82

A fish's eye view of the 1982 Winter Consumer Electronics Show.

Betsy Staples

At every Consumer Electronics Show there seems to be, if not a stated theme, at least a common denominator that reappears in booths all over the show floor.

At the most recent CES in Las Vegas it was arcade games. Some manufacturers, like Commodore and Coleco, had full size games in their booths to promote hand held or computer versions. Others--Atari, Mattel and Activision--had their own versions running on their own machines. All of them drew crowds.

In fact, it seems that these manufacturers have finally found something to rival the pornographic video tapes that have been the crowd pleasers for the past several years. And what better way to get a person hooked than to offer him a few free rounds of whatever game it is you are selling?

COMPUTERS AND PERIPHERALS

CES has never really caught on with most of the computer companies--the ones that do exhibit are there because they have other consumer electronics products to show. We were the only personal computing magazine with a booth, and many people stopped to ask "Where are all the computers?"

There were, however, several introductions of significant new products of interest to personal computing enthusiasts.

Commodore

Commodore introduced new machines at both ends of its home computer line. The Commodore Ultimax and the Commodore-64, both promised for delivery in "spring 1982," bracket the VIC 20 in price and capability. Carrying a suggested retail price of $149.95, the Ultimax is a programmable color computer designed to compete with the Atari VCS, Mattel Intellivision and Magnavox Odyssey. It features a flat membrane keyboard, can be programmed in Basic, and uses both cartridges and cassettes for games, programming and music synthesis.

The Commodore-64, which will be introduced with a suggested retail price of $595, will be marketed as a competitor for the Atari 800 and Apple II Plus. It features a CP/M option, 64K of memory, a 66-key full-stroke keyboard with upper and lower case capability, function keys, graphic characters, a game cartridge slot and game controllers. Audio capabilities include sound

The Commodore VIC 20 with an array of peripherals, including the VIC modem, floppy disk drive, printer and cassette recorder.

Systems With Spice...
Everything's Nice with California Computer Systems

Spice up your S-100 or Apple II™ with system enhancements from ASAP. From mother-boards and mainframe cabinets to I/O boards and RAMs, we have the California Computer System product that will give you the added capability you need.

FOR S-100 USERS

16K Static RAM Board — 200 nS RAMs, compatible with Alpha Micro, Cromemco and others. 16K memory divided into 4K blocks. Assembled and tested.

Part Number 2116C ..... Price: $290.00

32K Static RAM Board — 200 nS RAMs, compatible with Alpha Micro, Cromemco and others. 32K memory divided into 8K blocks. Fully static 2114 RAMs. Assembled and tested.

Part Number 2032C ..... Price: $610.00

64K Dynamic RAM Board — For 8080 and Z80 based S-100 systems. Provides processor-transparent refresh. 200 nS, 4MHz. Supports IMSAI-type front panels. Expandable. Assembled and tested.

Part Number 2065C ..... Price: $550.00

Z80A CPU Board — 2 or 4MHz, switch selectable. 158 instructions, including 8080's 78 instructions for total 8080 software compatibility. 2K monitor ROM and RS-232-C port on-board. Assembled and tested.

Part Number 2810A ..... Price: $265.00

Floppy Disk Controller — Controls up to four 5¼" and 8" drives in any combination. Double-sided and side-select signals for double-sided drives. Compatible with IBM 3740 and System 34 standards.

Part Number 2422A ..... Price: $365.00

CP/M™ Version 2.2 Free With Purchase

S-100 Mainframe — 12-slot motherboard. Active termination on all bus lines. Built-in power supply, fan and circuit breaker. "Double path" trace pattern. Solder plated circuit area. Assembled and tested.

Part Number 2200A ..... Price: $475.00
2201A (220VAC) $475.00

S-100 Motherboard — 12-slot capacity using standard S-100 connectors. Capable of supporting CPU's at 4MHz and above. "Double path" trace pattern. On-board voltage regulator, with termination.

Part Number 2501A ..... Price: $150.00

4-Port Serial I/O Interface — 4 individually-controlled asynchronous ports. Fully buffered inputs and outputs. Includes ROM circuitry for 2716 2K EPROM (user supplied). Ports meet RS-232-C interface specs. 3 control and 3 status registers per port.

Part Number 2710A ..... Price: $275.00

2-Serial, 2-Parallel I/O Board —Fully buffered inputs and outputs. Includes ROM circuitry for 2716 2K EPROM (user supplied). Parallel ports have full four-line-per-port handshaking and 8-bit data transfer. Serial ports meet RS-232-C interface specs. Port A transmits and receives in asynchronous mode; Port B in either synchronous or asynchronous.

Part Number 2719A ..... Price: $275.00

4-Port Parallel I/O Board — 3 I/O ports and one output port. Seven bit status register. Fully buffered inputs and outputs. ROM circuitry for 2716 2K EPROM (user supplied). Ports provide 8-bit parallel data transfer; TTL-compatible.

Part Number 2720A ..... Price: $195.00

FOR APPLE II™ USERS

Synchronous Serial Interface — Compatible with RS-232-C (configurations A thru E, 1978). Supports full or half duplex. DTC type interface.

Part Number 7712A ..... Price: $149.00

Programmable Timer — Time events in continuous, single shot, frequency comparison and pulse width comparison modes. Interface patch area for custom interface applications.

Part Number 7440A ..... Price: $ 95.00

Asynchronous Serial Interface — RS-232-C compatible (configurations A thru E, 1978), DCE type interface; supports half or full duplex operation.

Part Number 7710A ..... Price: $139.00

Calendar/Clock Module — Accurate, real-time counting. Software programmable for 12- or 24-hour format. Each decimal digit of data is separately addressed for freedom of data format.

Part Number 7424 ..... Price: $ 99.00

3¾ Digit BCD A-to-D Converter — Converts DC voltages to BCD numbers for monitoring and analysis. 400 mSec per conversion. -3.999 to +3.999 VDC full scale. ±5% non-linearity.

Part Number 7470A ..... Price: $ 95.00

12K ROM/PROM Module — Capable of accepting operating systems, system patches or firmware in 2K increments of mixed ROM or PROM. Addressable 12K in any of 4 16K blocks. 2316E ROM and 2716 PROM compatible.

Part Number 7114A ..... Price: $ 85.00

Parallel Interface — Two bidirectional 8-bit buses for interface to peripherals. Two programmable control registers. Four individually controlled interrupt input lines, two usable as peripheral control outputs.

Part Number 7720A ..... Price: $125.00

Arithmetic Processor — Add, subtract, multiply and divide; trig and inverse trig functions; square roots, logarithms and exponentiation. Fixed point 16 and 32-bit operation.

Part Number 7811A ..... Price: $349.00

Centronics Printer Interface —Interfaces high-speed Centronics-type parallel printers to Apple II™ computers. Features 8-bit parallel data output bus, 4-bit status input, Data Strobe and Acknowledge handshake signals and printer reset signal.

Part Number 7728A ..... Price: $125.00

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1198 E. Willow St., Signal Hill, CA 90806

Toll free outside California:
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Terms: We accept cash, check, money orders, Visa & Master Charge (U.S. Funds only). Tax: 6% Calif. res. COD's and terms available on approval (school PO's accepted).

CIRCLE 109 ON READER SERVICE CARD

generation, polyphonic tones, music synthesis and hi fi output.

Along with the 16K SuperVIC, an expanded memory version of the VIC 20, Commodore announced seven new cartridge games for the VIC. *Jupiter Lander, VIC Avenger, Superslot, Draw Poker, Super Alien, Midnight Drive* and *Magic Mouse* retail for $29.95 each.

In addition to the cartridge games, Commodore released the *Home Calculation Program Pack*, a series of six programs on cassette.

Other additions to the VIC line are memory expanders and a modem. The VIC-1110, which sells for $59.95, plugs into the memory expansion port of the VIC 20 to increase program capacity and add 8192 bytes of memory. The VIC-1210 is a 3K memory expander available for $39.95.

Introduced as the "lowest-priced modem in the personal computing industry," the VIC Modem is a plug-in cartridge which connects to the user port of the VIC 20 and may be used with any modular style telephone. It operates at 300 baud with originate/answer and half/full duplex capabilities and retails for $109.95.

Commodore Business Machines, Inc., Computer Services Division, 681 Moore Rd., King of Prussia, PA 19406. (215)377-7100.

Texas Instruments

Don Bynum, manager of the home computer division of TI, keeps his TI 99/4 in an old piano. A while ago he told TI designers that the way to job security was to ensure that all new peripherals would fit in that piano. Space inside the piano is now at a premium, but the designers are said to be still employed. The reason is a peripheral expansion system slated for release in the second quarter of this year.

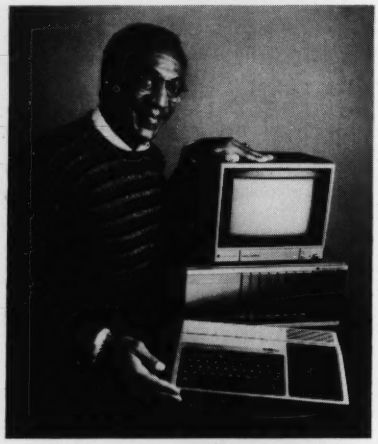
The unit, which measures 14" x 15" x 20" has eight slots for peripheral, board-type modules and room for one disk drive within the enclosure. Up to two additional drives can be added externally. The expansion system has a suggested retail price of $249.95.

The peripheral modules to be released are a memory expansion module which adds 32K of RAM to the computer ($249.95); a p-code module, which is used for writing Pascal programs ($249.95); a disk controller module, which will be able to handle double-sided 5 1/4" disks ($249.95); and an RS-232 interface module, which provides a parallel port for interfacing with printers ($174.95).

A UCSD p-system peripheral, which is identical to the p-code module, allows users of the 99/4 and 99/4A to run UCSD Pascal Version IV.0. Price for the system is $399.95.

Also shown for the first time at CES was a "mini-RAM" for the TI home computer. It plugs into the cartridge slot to provide 4K of non-volatile CPU RAM. It offers ROM support and allows the user to write to or read from Basic and to call assembly language routines from Basic. The cartridge comes with a cassette containing a line-by-line assembler.

Of course, without software, hardware--whether it fits into a piano or not--might as well be a boat anchor, so TI introduced about 30 new software packages. New systems software includes a Pascal compiler; an editor, filer and utilities package for screen editing and file management; and an assembler/linker package for developing TMS 9900 assembly language programs, all for use with the p-System peripheral.



Bill Cosby poses with the TI99/4A and new peripheral expansion unit.

An *Editor/Assembler* package, priced at $99.95, allows users to program on the machine level via TMS 9900 assembly language. Programs can be run as stand-alone programs or linked into TI Basic programs as subroutines.

Among the applications software released are ten games: *Tombstone City: 21st Century, TI Invaders, Car Wars, Adventure, Pirate Adventure, Munch Man, Draw Poker, Yahtzee, Blasto,* and *Hustle.*

New educational packages include *Speak & Spell, Speak & Math, Spell Writer, Addition/Subtraction I, Addition/Subtraction II, Multiplication I,* and *Teach Yourself Extended Basic.* Additions to the Business Aids Library are *Inventory Management, Invoice Management* and *Cash Management.* Other new packages include *Terminal Emulator II, Basketball Statistician, Bridge Bidding II, Bridge Bidding III, Structural Engineering Library* and *Electrical Engineering Library.* Prices range from $24.95 to $69.95.

Texas Instruments Incorporated, P.O. Box 53, Lubbock, TX 79408.

CIRCLE 299 ON READER SERVICE CARD

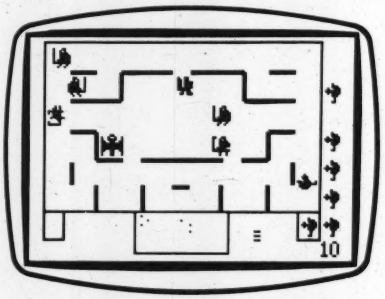
Astrovision

Astrovision introduced the ZGrass-32 personal computer add-on to the Astro Professional Arcade (formerly the Bally Professional Arcade). It is Z-80 based and features a full-stroke keyboard and 32K ROM. The ZGrass language, combined with a Votrax chip and Astro Arcade chips, allows users to create 256-color animation,

The ZGrass-32 personal computer from Astrovision.

sound effects, three-voice music, and speech. The ZGrass-32 is expandable to run CP/M and has interfaces for light pen, graphics tablet, disk drives, and joysticks, and includes two RS-232 ports for communication. The add-on, which carries a retail price of $600, should be available in April.

The *Music Maker* cartridge for the Astro Arcade was scheduled for release in March. It allows users to adjust pitch, vibrato, tempo, noise, volume, attack and decay to create synthesized music or sound effects. Multi-colored pictures can be created with the *Coloring Book with Light Pen* package.



The Wizard, a new game for the Astrovision Arcade.

New to the game repertoire of the Arcade are *Munchie, The Wizard, Cosmic Raiders, Solar Conqueror, Space Fortress, Quest for the Orb* and *Pirate's Chase*. The cartridges will be priced at $24.95 to $35.95.

Astrovision, Inc., 6460 Busch Blvd., Suite 215, Columbus, OH 43229. (614)855-0130.

CIRCLE 300 ON READER SERVICE CARD

From the Orient

Toshiba America previewed its first personal computer, the Model T-100. The

basic unit includes a Z-80A microprocessor; a 90-key keyboard with programmable keys, a numeric keypad and cursor controls; and expansion ports. Up to 32K of RAM and 32K of ROM is available in cassette-like packs that plug into the computer. The addition of a floppy disk system offers up to 560K of storage.

The Toshiba T-100 personal computer with flat-panel LCD display.

The display for the T-100 is a separate unit for which Toshiba offers five options, the most interesting of which is a flat-panel LCD which displays eight lines of 40 characters. Other options include a 12", 25 x 80 green phosphor display; a 14", 24 x 36 color display; a 14", 80 x 25 color display; and an RF modulator adapter for use with a color TV set.

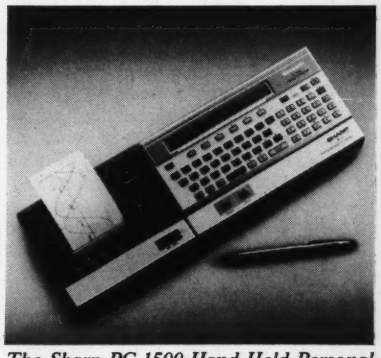
Prices will be set upon official introduction of the system at the National Computer Conference in June.

Toshiba America, Inc., Information Processing Systems Division, 2441 Michelle Dr., Tustin, CA 92680. (714)730-5000.

CIRCLE 301 ON READER SERVICE CARD

Sharp

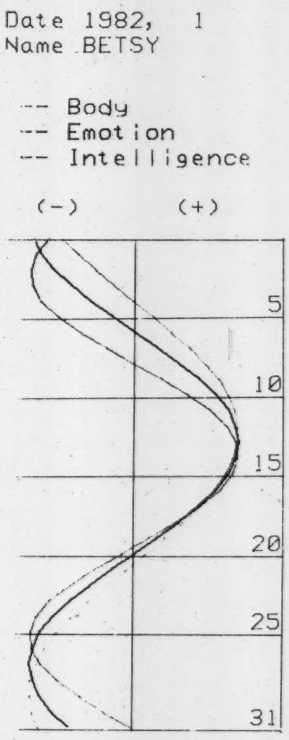
We were very impressed with the Sharp PC-1500 Hand Held Personal Computer and its tiny color graphics printer. It has 16K of ROM and 3.5K of RAM which can be expanded to 7.5K by adding the optional 4K memory module for $75.



The Sharp PC-1500 Hand Held Personal Computer.

The machine features six programmable keys and added Basic language terms to provide variables that can be defined using one or two characters, variables in two-dimensional arrays, strings, and commands for the 7 x 156 dot mini-graphic display. Suggested retail price for the computer is $300.

The little add-on printer is truly amazing. It prints in four colors (red, blue, green and black) in four directions (up, down, right and left) in nine character sizes. Not only did it do a tidy job plotting my biorhythm for the month, but it was correct—notice the triple valley during the week of the 25th.



Printout of the editor's biorhythm as calculated by the PC-1500. The curves are printed in contrasting colors.

Print speed is 11 characters per second on 2 9/32"-wide paper. The suggested retail price for the printer/cassette interface is $250.

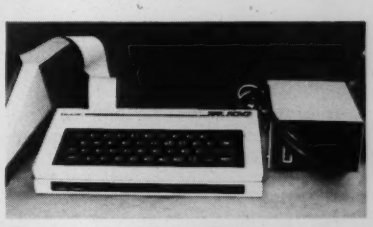
Sharp Electronics Corporation, 10 Sharp Plaza, Paramus, NJ 07652. (201)265-5600.

CIRCLE 302 ON READER SERVICE CARD

Panasonic

Another small, if not quite pocket size, computer is the Panasonic JR-100 personal computer. It has what we sometimes describe as a "Chiclet-style" keyboard similar to that of the TRS-80 Color Computer. Each key is a small square of plastic which can be pressed, but it is not a full-stroke keyboard.

When it is released, it will have joystick controllers, a printer, I/O expansion units (each of which will add 16K up to a maximum of 48K), a music adapter and an RS-232 serial interface.



The Panasonic JR-100 Personal Computer.

The projected price for the basic 16K unit to drive a black and white TV set is $200. The basic unit with a color driver is $300.

The Basic language is entered by means of keywords, but the Panasonic spokeswoman did not know whether it was Microsoft Basic. The machine appears to have an extensive graphics character set as well as the standard alpha/numerics.

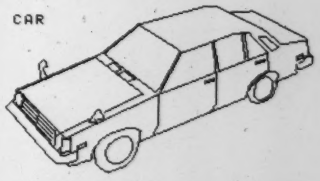
Panasonic, One Panasonic Way, Secaucus, NJ 07094.

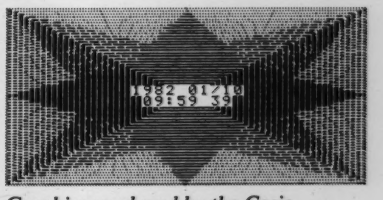
CIRCLE 303 ON READER SERVICE CARD

Casio

The Casio FX-9000P is available for immediate delivery at a retail price of $1199. The display and 67-key keyboard are built into the compact unit which is equipped with a fully applicable RAM file control function and uses the RAM package as a program and data file medium.

A unique feature is the 4K slot-in CMOS RAMs on which programs can be stored





Graphics produced by the Casio FX-9000P.

The Casio FX-9000P.

for up to three years. The computer can be expanded to include up to 32K bytes of RAM. A graphics printer is optional.

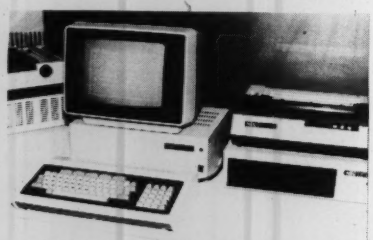
Casio, Inc., 15 Gardner Rd., Fairfield, NJ 07006. (201)575-7400.

CIRCLE 304 ON READER SERVICE CARD

NEC

NEC was featuring the PC-8000 Series Application Software for business and professional use. The NEC General Accounting System consists of several independent programs which can be used either on a stand-alone basis or integrated to allow the tracking of up to 1000 general ledger accounts.

The *Accounts Receivable System* allows tracking of up to 600 customers per disk,



The NEC PC-8000 personal computer with color monitor, printer and disk drives.

and provides the user with the ability to analyze his customer base in several ways. The system will also print mailing labels and past due notices.

The *Payroll System* tracks an unlimited number of employees with each disk maintaining complete data for up to 100. The system handles the requirements for all states, plus Puerto Rico and the District of Columbia. It prints paychecks and W-2 forms and provides an audit trail.

The NEC *Job Cost System* helps the user prepare an original bid or estimate on a particular job, and then tracks and reports on the costs as they accrue. Up to 100 cost accounts may be created.

Up to 1000 items can be tracked on a single disk using the *Inventory Control System*. The system prints invoices, packing lists, coded price labels, and purchase order forms.

Report Manager is a CP/M-based calculating instrument and electronic spread sheet. Features include editing commands, a field which can be up to 255 cells wide, 255 cells long and 255 cells deep, the ability to copy cells, lists, two-dimensional and three-dimensional matrices from one region to another, and the ability to create four independent viewing sections.

The CP/M-based *Word Processing System* includes a self-teaching instruction disk and spelling checker containing 9700 words along with provision for an additional 2000 words chosen by the user.

The *"Answer" Information Organizer* is a data base management system which uses an information storage technique called threading which allows any record in the file to be attached to any other record.

The *Creative Programming Series* consists of six hands-on, interactive guides to the basics of computer programming for the first time user of any age.

NEC Home Electronics USA, Personal Computer Division, 1401 Estes Ave., Elk Grove Village, IL 60007. (312)228-5900.

CIRCLE 305 ON READER SERVICE CARD

Tatung

The Tatung Computer uses a Z80A microprocessor running at 4 MHz, and a floppy disk drive with one megabyte of storage capacity. The system can run either CP/M or MP/M and has 16K built into the terminal while the computer unit itself has 64K built in. The terminals are separate from the computer unit.

The computer unit contains one or two 8" disk drives and the CP/U in memory. The basic unit has both serial I/O and

The Tatung computer with disk drive.

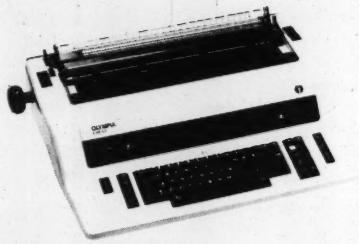
parallel for a Centronics printer. The Model UT 1820 has a full keyboard with full-stroke keys as well as two rows of 16 special function keys. Availability is scheduled for April or May and retail pricing should be in the $2-3000 range.

Tatung Co. of America Inc., 2850 El Presidio St., Long Beach, CA 90810.

CIRCLE 306 ON READER SERVICE CARD

From Germany

Olympia has added two new letter quality printers to its line. The ESW 102 uses the Olympia Whisperdisk print wheel, and features changeable typestyles, proportional spacing, four pitches, bi-directional printing and a print speed of 17.5 characters per second. It is priced at $1590, about



The Olympia ESW 103 letter quality printer.

one-half the cost of other daisywheel printers.

The ESW 103 incorporates all the features of the ESW 102 and may be used as an electronic typewriter as well. It retails for $1990.

Olympia USA Inc., Box 22, Somerville, NJ 08876. (201)722-7000.

CIRCLE 307 ON READER SERVICE CARD

VIDEO GAMES

Atari

Two large, furry Pac-Man characters, a yellow mouth and a red energy dot, heralded the introduction of the new advanced game system unveiled by Atari at a reception the night before CES opened.

The clarity and color of the graphics and the wide range of sounds—from music notes to explosions—produced by the new game system lead us to suspect that a close inspection of its innards might reveal at least a close cousin of an Atari 400 home computer.

A universal controller (which was snatched from our hands when we tried to inspect it) is said to combine the operation of the joystick, paddle and keyboard in a single hand-held unit that looks and operates like a pocket calculator. The control stick moves incrementally in eight directions and controls the speed of game characters.

The streamlined console has a single electrical cord and built-in storage areas for controllers as well as a built-in switchbox that automatically switches from television programming to game play.

Delivery of the unit is scheduled for the second half of 1982, in time for the Christmas season. The suggested retail price is $349.95.

The Home Computer Division of Atari Inc. introduced three new games, a bookkeeping package and a home filing system.

Pac-Man will be available in cartridge form for both the Atari 400 and 800 during the second quarter of 1982. It will sell for $44.95.

In *Centipede*, also a home version of a coin-op game, the player uses a bug blaster to defeat attacking spiders, fleas, scorpions, centipedes and poisonous mushrooms. Also available in cartridge form for the Atari 400 and 800, it is priced at $44.95 and will be available during the second quarter of 1982.

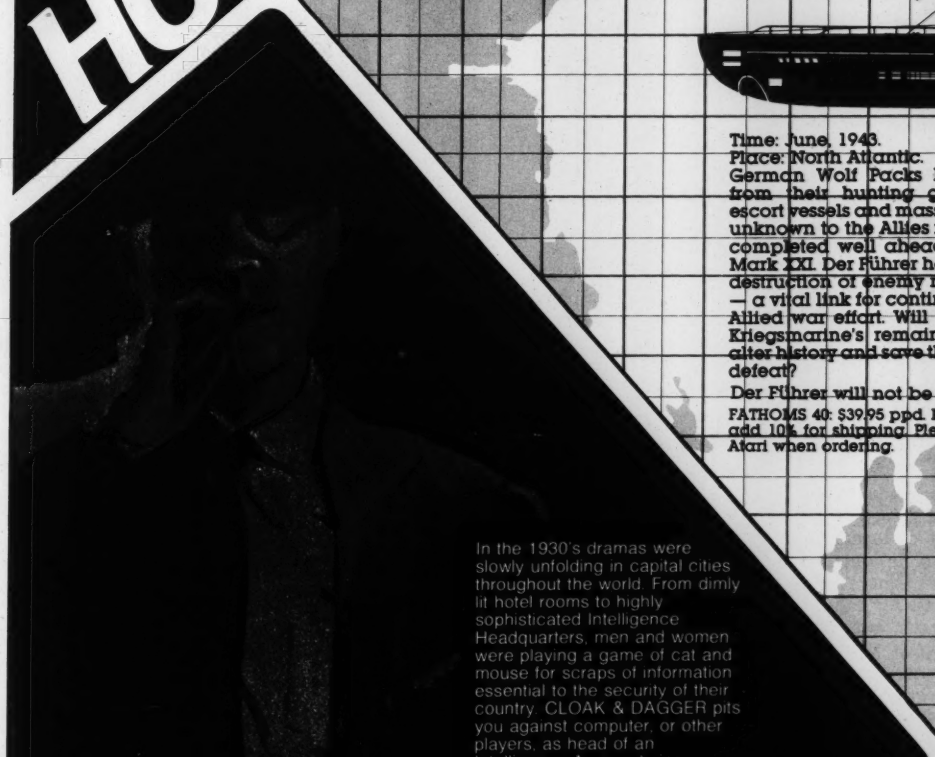
2 FROM HORIZON

Fathoms 40™

Time: June, 1943.
Place: North Atlantic.
German Wolf Packs have been driven from their hunting grounds by Allied escort vessels and massive air attacks. But unknown to the Allies is a Nazi super sub completed well ahead of schedule: The Mark XXI. Der Führer has demanded total destruction of enemy merchant shipping — a vital link for continued success of the Allied war effort. Will you, as one of the Kriegsmarine's remaining ace skippers, alter history and save the Third Reich from defeat?

Der Führer will not be disappointed!

FATHOMS 40: $39.95 ppd. Foreign, FPO and APO add 10% for shipping. Please specify Apple or Atari when ordering.



In the 1930's dramas were slowly unfolding in capital cities throughout the world. From dimly lit hotel rooms to highly sophisticated Intelligence Headquarters, men and women were playing a game of cat and mouse for scraps of information essential to the security of their country. CLOAK & DAGGER pits you against computer, or other players, as head of an Intelligence Agency trying desperately to stay one step ahead of its rivals. Moving agents from capital to capital, ferreting information, and offering bribes are fundamental parts of each player's turn . . . and your survival!

CLOAK & DAGGER™

CLOAK & DAGGER: $39.95 ppd. Foreign, FPO and APO add 10% for shipping. Please specify Apple or Atari when ordering.

For Apple II*: DOS 3.3, or Atari 800*: 48K with disk drive. Joysticks required. Games on Dysan** diskettes. Visa & MasterCard accepted. Dealer Inquiries Welcome, contact your local dealer for full details.

HORIZON SIMULATIONS
Horizon Simulations Inc.
7561 Crater Lake Highway / White City / Oregon 97503
(503) 826-4640

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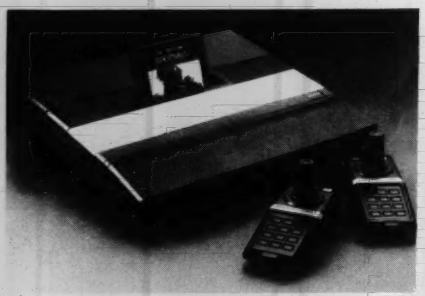
*Apple II, DOS 3.3 and Atari 800 are registered trademarks, respectively, of Apple Computer, Inc. and Atari, Inc. **Dysan is a registered trademark of Dysan Corporation.

C.E.S., continued...

In *Caverns of Mars*, the player must penetrate several layers of defenses to reach the aliens' stronghold. Floating mines, enemy ships and laser fire are among the hazards to be overcome. The $39.95 game is available on disk for Atari 400 and 800 computers.



The Atari Advanced Video Computer System and controllers.

The Bookkeeper is an accounting system designed for those who do business from their homes and for those who maintain their personal finances in a business-like fashion. It will handle 1000 transactions a month and up to 350 general ledger accounts, vendors and customers.

The program comes on four disks and requires an Atari 800 with Basic language cartridge and 48K of RAM, disk drive, 80-column printer and interface module.

The Home Filing Manager allows the user to create, store, edit, retrieve and print information on electronic index cards. The user can search in alphabetical or reverse alphabetical order or locate an entry by its title or a phrase it contains. The program consists of two program disks and one formatted data disk. It can be used on an Atari 400 or 800 with disk drive.

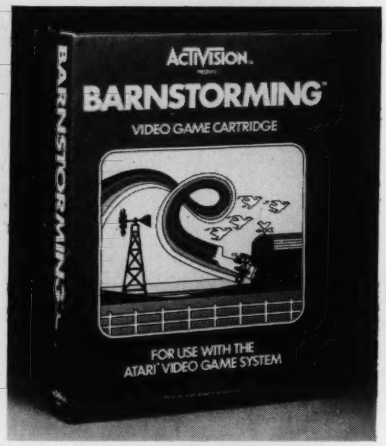
Atari Incorporated, Consumer Electronics Division, 1265 Borregas Ave., P.O. Box 427, Sunnyvale, CA 94086.

Activision

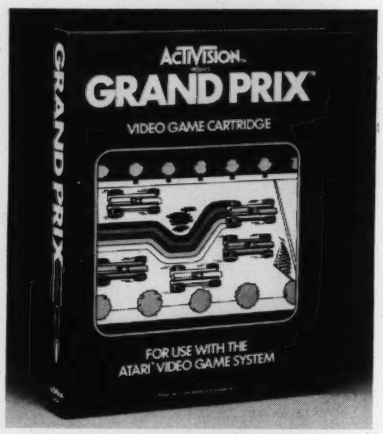
Activision chose a more spectacular, if somewhat chillier, way to announce its *Barnstorming* cartridge. Activision employees and a few hardy members of the press gathered at 6:00 a.m. in sub-freezing temperatures to travel by bus to a landing strip near the Las Vegas Airport. At the strip we met a small, open-cockpit bi-plane, turned around and followed as it taxied through the streets of Las Vegas to the convention center.

Be sure to vote for your favorite software packages. See page 216.

Activision chose a spectacular, if somewhat chilly, way to announce its Barnstorming cartridge.



In *Barnstorming*, the player uses a joystick to guide his bi-plane over windmills, through barns and around flocks of geese. Points are amassed as these hurdles are cleared, and speed counts.



Grand Prix features brightly-colored formula racing cars speeding down an asphalt road, dodging oil slicks, crossing bridges and avoiding collisions on the tree-lined roadway. The player uses a joystick as throttle, brake and steering device to race his car around one of four courses.

Both games are designed for use with the Atari Video Computer System and the Sears Tele-Game Video Arcade. They retail for $31.95 each and were scheduled for delivery in March.

Activision, Inc., 3255-2 Scott Blvd., Santa Clara, CA 95051. (408)727-7770.

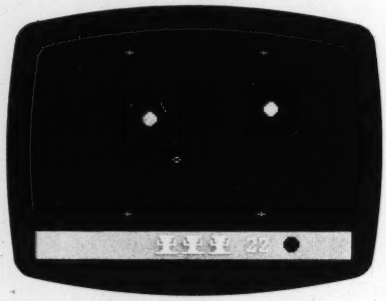
CIRCLE 308 ON READER SERVICE CARD

Imagic

Imagic, the newest producer of cartridges for the Atari VCS and Intellivision, made its debut with three game cartridges for the Atari system.

In *Star Voyager*, the player navigates a space ship past flashing stars and galaxies. Enemy ships fire and meteors crash into the ship. With each hit, the energy in the ship drops and the player must search for refueling stations. Essentially, this is a scaled down version of Star Raiders.

Demon Attack pits the player against invasions of flying monsters. The attackers appear in waves, each of which employs a different attack strategy.



Trick Shot from Imagic.

Trick Shot is a billiard game which combines three balls and a cue ball into 14 different game variations. It is a game that requires either a great deal of practice or considerably more information than we had when we tried it.

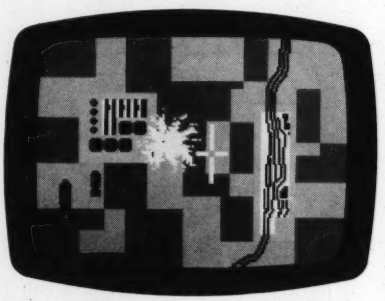
Prices for Imagic games range from $25 to $35.

Imagic Corporation, 20665 Fourth St., Saratoga, CA 95070.

CIRCLE 309 ON READER SERVICE CARD

Mattel

Mattel Electronics introduced its new products at an interminable press conference. They also announced that the Intellivision keyboard unit is being test marketed in New Orleans and Seattle—an announcement that has an all-too-familiar ring to it.



B-17 Bomber, a new voice cartridge for the Intellivision.

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This program is designed for individual student use or use in a classroom setting. Programs provide optional printer capability covering worksheet generation and performance monitoring. C.E.P.S. are available in three software formats.

Special editions available for California Proficiency Assesment Test and New York Regents Competency Tests. Call for Prices.

Krell's M.I.T. Logo for Apple* $179.95

Complete 4 disk set includes Library Disk, 20 program Tutorial Disk, **Alice In Logoland** and **2 COPIES OF M.I.T. LOGO FOR APPLE***

Odyssey In Time

This spectacular adventure game adds a new dimension of excitement and complexity to **Time Traveler.**

Odyssey In Time includes all the challenges of **Time Traveler** plus 10 additional eras. Each game is different and may be interrupted and saved at any point for later play. **$39.95**

Time Traveler

The best of the adventure games. Confronts the player with complex decision situations and the demand for real time action. Using the Time Machine, players face a challenging series of historical environments. To succeed you must build alliances and struggle with the ruling power. Each game is unique. **$24.95**

Isaac Newton +

Perhaps the most fascinating and valuable educational game ever devised - **ISAAC NEWTON** challenges the players (1-4) to assemble evidence and discern the underlying "Laws of Nature" that have produced this evidence. **ISAAC NEWTON** is an inductive game that allows players to intervene actively by proposing experiments to determine if new data conform to the "Laws of Nature" in question. Players may set the level of difficulty from simple to fiendishly complex.

F.G. Newton

Full Graphics Newton. This version of Isaac Newton presents all data in graphic form. Because data is graphic rather than symbolic, this game is suitable for very young children. Players may select difficulty levels challenging to the most skilled adults. **$49.95**

☆ *NEW* ☆

☆*MICRO-DEUTSCH*☆

Micro-Deutsch set includes 24 grammar lessons, covering all material of an introductory German course. Four test units also included. Grammar lessons use substitution transformation drills, item ordering, translations and verb drills. Drill vocabulary based on frequency lists. Suitable for use with any high school or college textbook. Extensively field tested at SUNY Stony Brook. Available for Apple II and PET/CBM. (PET version includes a special foreign language character chip.) Also available soon: MICRO-FRANCAIS, MICRO-ESPANOL, MICRO-IVRIT, MICRO-YIDDISH, MICRO-CHINESE, MICRO-JAPANESE. **$179.95**

☆ *NEW* ☆

☆Pythagoras and The Dragon☆

Mathematics in a fantasy game context. Based on **The Sword of Zedek**, **Pythagoras and The Dragon** introduces Pythagoras as a mentor to the player. When called on for aid, Pythagoras poses math questions, and depending on the speed and accuracy of the player response, confers secret information. With Pythagoras as an ally, the quest to overthrow Ra, The Master of Evil, assumes a new dimension of complexity. Depending on the level chosen, problems range from arithmetic through plane geometry.
32K **$39.95**

Free Bonus with purchase of $300.00 or more: Applesoft Tutor Series

Krell Software Corp. has no official ties with the College Entrance Examination Board or the Educational Testing Service. Krell is, however, a supplier of products to the E.T.S.

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CIRCLE 219 ON READER SERVICE CARD

While you are waiting for the keyboard unit to be test marketed in your area, you can jazz up your Intellivision with the Intellivoice Voice Synthesis Module. Synthesized voices of excellent quality introduce the games, cheer winners, warn of danger and offer strategic assistance.

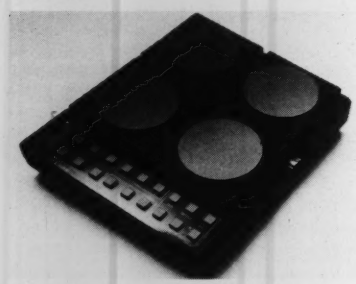
Game cartridges which will make use of the synthesized voices are *Space Spartans, B-17 Bomber* and *Bomb Squad*.

In *Space Spartans*, warlike enemies attack the player's spaceship, and he must hold off the alien warriors as long as possible.

In *B-17 Bomber*, the player must fly the plane to a selected site, bomb the target and return safely to his take-off point. *Bomb Squad* requires the player to break a numerical code, which has been programmed by terrorists, and defuse a time bomb.

Other new game cartridges for the Intellivision include *Star Strike, Space Hawks, Advanced Dungeons and Dragons, Utopia, Reversi, Night Stalker, Sub Hunt,* and *Frog Bog*. One cartridge which has yet to be named plays a selection of favorite card games, another is a video pinball game and two others are based on a concept from the new Disney movie "Tron."

Mattel also announced a hand held diet computer, the Diet Trac Personal Computer System which stores information and tracks nutritional intake from the six basic food categories as well as five nutritional groups. Dieters may follow the built-in "food exchange" diet plan or design individual programs.



Synsonics Drums from Mattel Electronics.

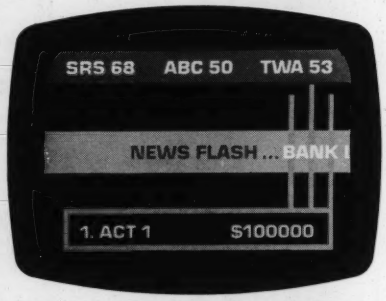
Another new Mattel product should find itself high on the shopping lists of parents whose children reside with an ex-spouse. Synsonics Drums features four drum pads (snare, tom tom 1, tom tom 2, and cymbal) with bass, accent and tempo control. Settings include automatic drum roll at varying speeds, record and playback, and pitch control. The microprocessor controlled unit connects to a home stereo or instrument amplifier, and can be used to compose music, practice drum skills or "entertain friends."

Mattel Electronics, 5150 Rosecrans Ave., Hawthorne, CA 90250. (213)978-5150.

CIRCLE 310 ON READER SERVICE CARD

Magnavox

Magnavox dramatized their slogan, "You can feel like a million bucks playing *The Great Wall Street Fortune Hunt,*" with a heavily-guarded display of one million dollars in silver dollars and poker chips. The latest in the Master Strategy Series for the Odyssey2 video game challenges players to anticipate market fluctuations in order to take full advantage of the buying and selling opportunities offered in the game.



The Great Wall Street Fortune Hunt, a new game for the Odyssey2.

The *Great Wall Street Fortune Hunt* can be played as a solitaire game, by two people playing against each other, or by teams of two or more people representing investment syndicates. The game, which features four levels of play, is priced at $49.95.

Keyboard Creations, also for the Odyssey2, uses the Odyssey 49-character keyboard to turn TV screens into message centers or bulletin boards, and can be used as a character generator for titling home VCR tapes. Another mode creates word and number games. Suggested retail price for the cartridge is $22.95.

N.A.P. Consumer Electronics, Interstate 40 and Straw Plains Pike, Knoxville, TN 37914.

CIRCLE 311 ON READER SERVICE CARD

Video Technology Ltd.

Creativision from Video Technology Ltd., another new entry in the video game market, features rectangular game controllers with built-in joysticks and membrane keyboard panels. The two controllers fit end-to-end in a track on the console to create a full qwerty keyboard. The console sells for about $200.

Twelve game cartridges, including versions of most of the current favorites, are listed as being available, but no price was given.

The Creativision Home Computer System is apparently an expanded version of the game unit. It features a 6502 microprocessor, 16K of dynamic RAM expandable to 64K, Video Tech Basic in a ROM cartridge and cassette interface. Again, no price was available.

Video Technology Ltd., 4th Floor, Flat F,G,H Freder Centre, 68 Sung Wong Toi Rd., Tokwawan, Kowloon, Hong Kong.

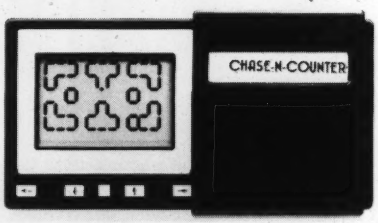
HANDHELD GAMES AND MISCELLANEOUS

General Consumer Electronics Corporation

Combining electronic fun and function, General Consumer Electronics Corporation introduced four additions to its line of game calculators and watches.

The quartz wristwatches tell the time and date, but also offer an LCD field on which to play four different games. Arcade Time features football, basketball and soccer.

Space-N-Counter with Phaser Fight, Meteorox and Star Sweep, and Chase-N-Counter with Treasure Quest, Eat-N-Run and Double Cross are full function calculators with built-in game fields. Both have memory, floating point decimal, percent key and a continuous time readout. All four products carry suggested retail prices under $40.



Chase-N-Counter game calculator from General Consumer Electronics Products.

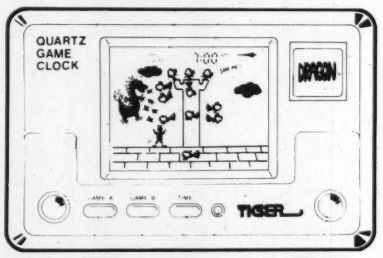
General Consumer Electronics Corp., 233 Wilshire Blvd., Santa Monica, CA 90401. (213)394-9667.

CIRCLE 312 ON READER SERVICE CARD

Tiger Electronics

Variations on the same theme are the LCD Watch Games from Tiger Electronics. These, however, are pocket watches, each of which offers two variations on a single game: Dragon, Caveman, King Kong or Space Fight.

Tiger has also announced four new modules of their K-2-8 children's computer. These include Talking Clock, Introduction



Dragon LCD watch game from Tiger Electronics.

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★ A PERSONAL FINANCIAL MANAGER

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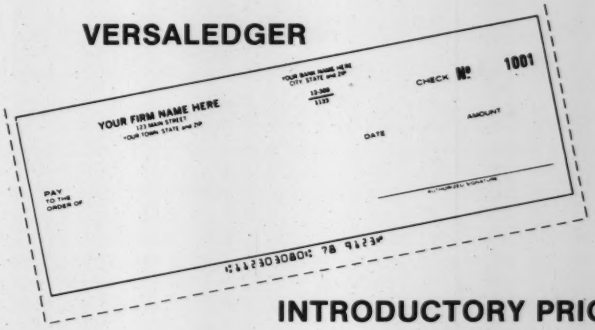
VERSALEDGER is a complete accounting system that grows as you or your business grows. To start, your VERSALEDGER acts as a simple method of keeping track of your checkbook. Just enter your check number, date and to whom the check is made out to. As you or your business grows, you may add more details to your transactions . . . . account number, detailed account explanations, etc.

- VERSALEDGER can give you an instant cash balance at anytime. **(IF YOU WANT IT TO)**
- VERSALEDGER can be used as a small personal checkbook register. **(IF YOU WANT IT TO)**
- VERSALEDGER can be used to run your million dollar corporation. **(IF YOU WANT IT TO)**
- VERSALEDGER prints checks. **(IF YOU WANT IT TO)**
- VERSALEDGER stores all check information forever. **(IF YOU WANT IT TO)**
- VERSALEDGER can handle more than one checkbook. **(IF YOU WANT IT TO)**
- VERSALEDGER can be used to replace a general ledger. **(IF YOU WANT IT TO)**



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  (500 checks per month on the Apple II)
  (2400 checks per month on the TRS-80 Model III)
  (6000 checks per month on the TRS-80 Model II)
  (3000 checks per month on single density 8" CP/M)
- VERSALEDGER will soon have an add-on payroll package. **(IF YOU NEED IT)**

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CIRCLE 138 ON READER SERVICE CARD

to Computer Programming, Beginning Algebra and Grammar I.

For pre-school children, five new Picture Book Module Packs have been added to the Talking Picture Book for two- to six-year old children.

Tiger Electronic Toys, Inc., 909 Orchard, Mundelein, IL 60060. (312)949-8100.

CIRCLE 313 ON READER SERVICE CARD

Western Publishing

Also aimed at pre-school children is Connectron from Western Publishing. The device, designed for three- to eight-year olds, consists of a series of word and picture books and a wand connected to a microprocessor.

The Connectron bar code reader/story book from Western Publishing.

The words in the books are underlined with bar codes, and when the wand is passed over the codes, a voice repeats the word. Approximately 1000 words are stored in five ROMs.

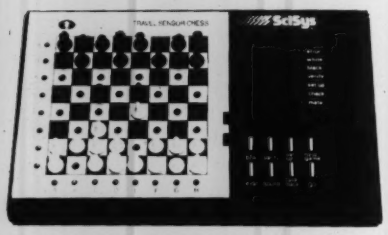
The unit is scheduled for delivery during the second half of 1982, and will carry a retail price in the $60 to $80 range.

Western Publishing Company, Inc., Racine, WI.

CIRCLE 314 ON READER SERVICE CARD

SciSys

SciSys Computer introduced Travel Sensor Chess, which measures 7.25" x 4.5" x 1.4". It features an Integral Sensorboard with red LEDs running parallel to the chessboard. The sensorboard automatically enters all moves as the pieces are advanced, and the LEDs indicate the coordinates of the computer's next move.



Travel Sensor Chess from SciSys.

The game offers eight levels of play and sells for under $50.

SciSys Computer Inc., One World Trade Center, Suite 86097, New York, NY 10048.

CIRCLE 315 ON READER SERVICE CARD

Coleco

While other companies flirt with the copyright/licensing problems associated with arcade game copies with sound-alike names and slightly modified screen displays, Coleco has taken the direct approach and formed alliances with some of the arcade game manufacturers.

Hand held versions of *Frogger, Donkey Kong, Berzerk, Pac-Man* and *Galaxian* are approximately 8" x 8" x 6" and feature hooded displays like those of their big brothers and sisters. All play three games, have joystick controls and record a best score. All but *Galaxian* have two skill levels.

Pac-Man and *Galaxian* were scheduled for delivery in the first quarter of 1982; the others will be available during the third quarter.

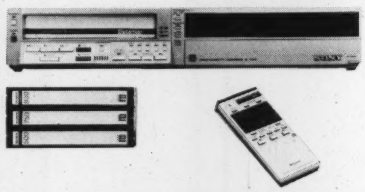
Coleco also announced a new line of cartridges of the Atari VCS and Intellivision. These, too, are licensed versions of the popular arcade games, and will be delivered during the third quarter of 1982.

Coleco Industries, Inc., 945 Asylum Ave., Hartford, CT 06105. (203)278-0280.

CIRCLE 316 ON READER SERVICE CARD

Sony

Sony Consumer Products Company introduced the SL-2500, a compact Betamax videocassette recorder which measures 17" x 13 3/8" x 3 1/8". It features front loading, high-speed picture search, multi-speed bi-directional playback, electronic indexing for random access to as many as nine selectable positions, and a two-week timer. Suggested retail price is $1500.



The compact Sony SL-2500 Betamax video cassette recorder.

Sony also announced the portable PCM-F1 digital audio processor, a device that enables a video cassette recorder to record and play digital audio cassettes. It works with any NTSC-standard videocassette recorder—U-Matic, Beta or VHS—but was designed specifically for use with the Sony SL-2000 BetaPak. The PCM-F1 will be available in the spring of 1982 at a suggested retail price of $1900.

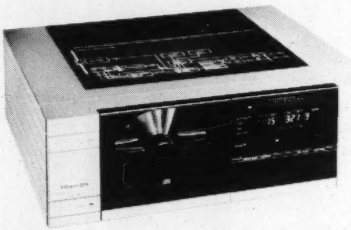
The Sony portable PCM-F1 digital audio processor.

Sony Consumer Products Company, 9 West 57th St., New York, NY 10019. (212)371-5800.

CIRCLE 317 ON READER SERVICE CARD

Toshiba

A prototype of the Toshiba XR-81 digital audio disc player was on display for the first time in the U.S. The device uses a laser beam to "read" audio signals off the surface of a 4 1/2" disc. The detected signal is then processed through a converter to recover the information and transform it into music.



The Toshiba XR-81 digital audio disk player.

Toshiba America Inc., Consumer Electronics Division, 82 Totowa Rd., Wayne, NJ 07470.

CIRCLE 318 ON READER SERVICE CARD

Right to Tape

One group which has a problem rather than a product as its *raison d'etre* was the Right to Tape Committee. It is their position that "the Ninth Circuit Court of Appeals decision of October 19, 1981, with regard to the use of private video tape recorders for recording TV programs off-the-air, not only threatens serious harm to an important growing industry, but also represents an unjustified invasion of privacy never envisioned in the Copyright Act on which the Court decision is based."

Their primary argument is that people who tape TV programs do so not to make a permanent library copy of the program, but to make a temporary copy that can be viewed at a more convenient time and then erased. They claim that this practice leads to larger audiences for programs, which enables copyright holders to "strike a better financial deal" for their artistic and creative product.

For more information contact Gary Shapiro, 1201 Pennsylvania Ave., 4th Fl., Washington, D.C. 20004, (202)626-6721.□

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CIRCLE 137 ON READER SERVICE CARD

Through the Fog

David H. Ahl

Upon embarking from a jammed TWA flight, Betsy and I were greeted by a British Rail strike. This made getting to Birmingham a less-than-wonderful experience. A week of fog and drizzle did nothing for our outlook or health, but we had come to see computers, not the countryside.

Which Computer? That was the name of the show that we were attending at the National Exposition Centre. Principally a trade show, it most closely resembled the Comdex show here in the States. Although the main focus was business applications of small computers with exhibitors such as DEC and Data General, it had much of interest to personal computer enthusiasts.

The Japanese manufacturers frequently use Britain as a test market for new products before introducing them in the United States. Although some of these machines never reach our shores, it is still interesting and informative to see what the Japanese have in store for the English-speaking world.

Also, Britain is considerably ahead of the United States in implementing systems for broadcasting material from computerized data banks. Viewdata and Prestel have been in widespread operation for some time and now many manufacturers are marketing low-cost terminals for utilizing these data banks.

Furthermore, Britain has made a strong commitment to extend computer literacy to every person in the country. They feel, rightly so, that computers are the wave of the future and that every citizen ought to be able to take advantage of their potential. Thus, the government is supporting educational computer programs in schools by picking up 50 percent of the cost of the hardware as well as sponsoring a twice-weekly program on BBC television.

The BBC Microcomputer System

The BBC system consists of two models, both of which can use a standard TV set or monitor as a display, a Teletext receiver, a Prestel option, and optional disk system and peripherals.

The standard model is based on a 2MHz 6505 mpu with 16K of RAM and 32K of ROM; the ROM includes a 16K Basic and 15K operating system. The system has eight different display modes including a text mode, 40 x 25 characters mode and a 320 x 256 high resolution graphics mode. It can display up to eight colors.

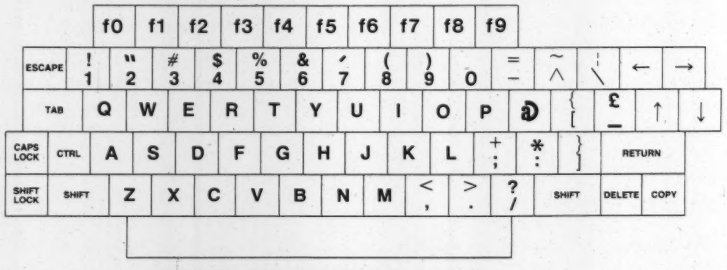
The system has interfaces for cassette, TV set and video monitor. Disk and communications interfaces are optional.

The enhanced model has an enhanced display mode giving 80 x 25 characters and 640 x 256 high resolution graphics, 32K RAM, A-D interfaces, Centronics printer interface, and RS423 interface.

The BBC Basic specification is fairly standard, i.e., close to Microsoft. Extensions include long variable names, integer variable types and extensive string operations (largely using Microsoft syntax). Attention has been paid to the emphasis on program structure (a la Pascal), and BBC Basic supports IF...THEN...ELSE, REPEAT...UNTIL, and multi-line named functions and procedures with local variable declarations. Assembly language routines can be written into a Basic program and high resolution color graphics are well supported.

It is rumored that once Acorn irons out a few manufacturing wrinkles, they plan to offer the machine in the United States. Don't look for this any time soon since demand is exceptionally strong in Britain and production has not yet caught up. It is also rumored that other British manufacturers, notably Sinclair, will be bringing out their own versions of the BBC machine but for now these are just rumors.

There are currently ten half-hour courses in the television series which started airing in January 1982. In addition, the National Extension College is providing a 30-hour introductory course in Basic programming for home use.



BBC MICROCOMPUTER KEYBOARD LAYOUT

May 1982 © Creative Computing

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The Soundchaser Gives Apple Owners A Chance To Become Musicians— And Musicians A Reason To Buy Apples

Your Apple Can Be the Heart of a Sophisticated Sound Studio

Would you like real music and total control? The Soundchaser Computer Music System coupled with an Apple computer produces dazzling results. While a studio synthesizer can cost as much as a small house, Soundchaser gives you a polyphonic synthesizer and multibank sequencer, with features found on most professional systems, for about the same cost as twenty hours of studio time. The system represents a new generation in music, combining computer and synthesizer hardware under the control of sophisticated software. Add a human at the keyboard and you've got a dynamite package.

The keyboard is exceptional. It is a professional, four-octave, 49-note unit housed in a handsome wood cabinet. It looks as good as it sounds. Just as important, it feels right. Installation is simple: the keyboard interface plugs into peripheral slot seven in the Apple. No special wiring or chip changes are required. As soon as you insert the card, the keyboard is ready to talk to the Apple. Add a synthesizer, and you can play live, lay down a sequence, or play over a recorded sequence.

Outstanding Synthesizer Hardware

The Soundchaser Voice Card is a computer.controlled, full-feature, dynamic synthesizer. Each card provides three voices. A two-card system with a total of six voices is recommeded, but we don't lock you into one product line. Soundchaser can sing just as well with other synthesizers, most notably the Mountain Music System. This board is highly regarded by Passport Designs and by pairing the sixteen channels, they allow the Soundchaser system to produce eight full-bodied voices.

The Software Side of the Story

A system that's hard to use is less than worthless. You want to concentrate on music, not programming. Soundchaser helps you out with intelligent and flexible menu-driven software. A highlight of the software is the Editor. With the aid of graphically displayed envelopes, slides, and switches, you can create a wide range of instrument sounds. Envelopes and oscillator waveforms are drawn right on the screen. There is no better aid for experimentation than this.

Once you create an instrument sound, it's onto the Sequencer. Here, you can record a sequence of notes, storing them in memory. Later, the sequence can be played back, using a new instrument sound if desired. You can sit back and listen, or play live over the sequence. Instruments and sequences can easily be saved to disk and retrieved, all under program control.

Added Support

Passport Designs has already produced a full series of support software to augment Soundchaser. The Notewriter displays your music in standard notation on the hi-res screen, right as you play. It lets you easily write your own lead sheets and fake books. There is no simpler way to produce sheet music, and you can obtain hard copy using virtually any graphics printer. With the Notewriter, you can compose, arrange,and transcribe without having the drudge work get in the way of your creativity.

The Musictutor transforms Soundchaser into a challenging educational tool. The software includes programmed courses in ear training, music theory, and harmony. It can be used both by teachers and by individuals who want to sharpen their musical skills (curriculum outline is available upon request).

The software will continue to grow, so Soundchaser will never grow obsolete. For those with the interest and desire, the manual includes instructions for accessing the keyboard from user programs.

Soundchaser Packages

Soundchaser with Dual 3-Voice Synthesizer Boards (Six Voices)	$1350.00
Soundchaser with Mountain Music System Boards (Eight Voices)	$1045.00
Notewriter (1 Disk)	$50.00
Musictutor (4 Disks)	$150.00

Soundchaser Keyboard and Interface without Synthesizers $650.00

System Requirements

Apple II or Apple II Plus, 48K, Disk Drive, Paddles, Monitor or Television with RF Modulator (black and white or color), and printer (only required for making hard copy from Notewriter).

Write for free brochure. Dealer inquires invited. To order your system send payment* and shipping charged indicated to Creative Computing, Dept. C025A, One Park Avenue, New York, N.Y. 10016. Orders may also be charged to your Visa, MasterCard or American Express account—by mail include credit card name, number and expiration date, or if you prefer, use our 24 hour toll-free number, 800-631-8112. In NJ only 201-540-0445.

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Package #1 or 2	$10.00
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Soundchaser (independently)	$6.00

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Peripherals Plus

Through Fog, continued...

NewBrain by Grundy Business Systems

The NewBrain is an amazingly compact computer measuring just 7 x 10 x 2 inches. It is based on a Z80A mpu and has 24K of ROM and 32K of RAM. It has a calculator-type keyboard, i.e., short movement keys, but in a standard QWERTY layout. It drives a standard TV set or monitor and provides a display of 24 lines of either 40 or 80 characters. Text may be mixed with high resolution graphics of up to 240 x 256 or 240 x 512 pixels.

A 1200 baud cassette interface is built in along with a serial printer interface and communications interface. Other interfaces are available as options.

NewBrain software includes a screen editor, Basic compiler, high-speed floating point math package and, of course, an operating system. An extension of ANSI standard Basic, it includes unlimited length string handling, program chaining, external call capability, and DMA handling.

First availability is April 1982. Prices start at about $400 although the unit is not expected to be immediately available in the U.S. For more information, contact Grundy Business Systems Ltd., Science Park, Milton Road, Cambridge CB4 4BH, England.

Sharp Electronics

We continue to be surprised that Sharp has not introduced the MZ80K computer in the United States. Sharp recently announced production of the 100,000th unit and it is one of the most popular computers in Britain.

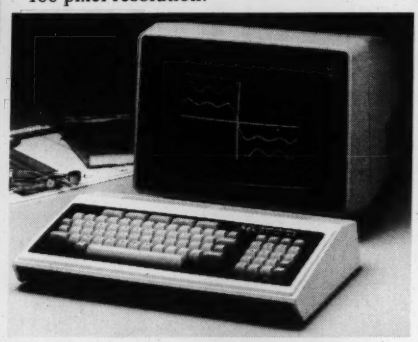
The latest member of the MZ family is the MZ80B, a high-end system with 64K RAM, 2K video RAM to store a switchable 40- or 80-character x 25-line text display, two 8K graphics RAMs which independently map the screen using 320 x 200 pixels.

The unit has provision to install twin double density, double-sided floppy disk drives with 560K bytes per unit. Also, Sharpsoft Ltd., the British distributor, is offering two Winchester disk systems offering 6M bytes and 12M bytes respectively. The disk is configured as a CP/M device to enhance compatability with existing software.

A MZ80B system with 64K RAM, single disk drive and printer costs about $4600.

NEC PC8000B Series

The PC8000B Series is an update of the PC8001 (*Creative Computing*, Sept. 1981, pp 65-66). The computer is based on the NEC equivalent to the Z80A mpu and comes with 32K of RAM and 24K ROM containing N-Basic and a screen editor. The full-size keyboard has a numeric pad and four programmable function keys. Eight-color graphics are available in 160 x 100 pixel resolution.



N-Basic is based on Microsoft Basic but it incorporates many additional graphics commands. A very nice feature while in text mode is the ability to define a scroll area less than the full screen as well as four character per line specs (36, 40, 72 and 80).

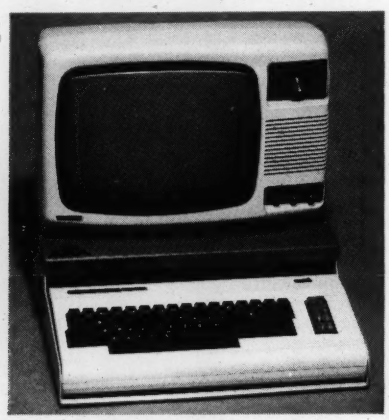
Integrex CX80 Color Matrix Printer

At last! A low-cost, 7-color, easy-to-use printer for small computers. Actually, seven colors isn't quite accurate. The CX80 ribbon has three lengthwise color stripes which can be combined into the seven print colors by overstriking. A microprocessor built into the CX80 translates the color specifications from the computer into the correct combinations for the printer.

The character ROM contains 96 ASCII (5 x 7 format) and 64 PET graphics characters (6 x 7 format); 15 characters are user programmable. All characters may be printed double width (elongated) and/or reversed (white character, color background).

The printer uses a standard Centronics-type interface. However, Apple owners will be delighted to note that an Apple dump card is available which will transfer the color screen directly to the printer with no further programming.

We are trying to track down pricing and U.S. availability information. Keep tuned.



VIC 20 Expansion Unit from Arfon Micro

The VIC 20 Expansion Unit is an aluminum shell into which the Commodore VIC 20 fits. It replaces the VIC power supply with a heavy-duty unit and provides a motherboard with seven peripheral slots. The cover of the unit provides a base for a TV set.

For people who have purchased 3K memory packs for their VICs and wonder how they can add anything else, this unit may be just the thing.

Arfon also offers add-on memory packs and a speech synthesis unit for the VIC. For more information, contact Arfon Micro, Cibyn Industrial Estate, Caernarfon, Gwynedd, Wales.

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 IF :DISTANCE > 200 THEN STOP
 FORWARD :DISTANCE
 RIGHT :ANGLE
 SQUIRAL :ANGLE :DISTANCE + 3
END
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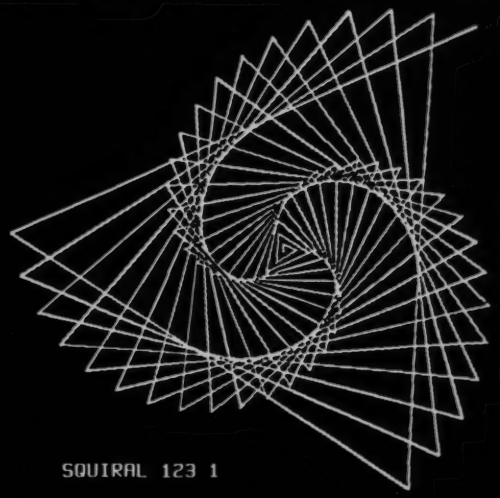

SQUIRAL 123 1

Terrapin, the Turtle Company, brings you the Terrapin Logo Language for the Apple II with Turtle graphics, now ready for immediate delivery.

The Terrapin Logo language is for students and teachers at every level. It was carefully designed by professional educators and artificial intelligence researchers to promote structured, logical thinking. It encourages exploration and experimentation, helping students to take an active role in the learning process. The language is so easy to use that it quickly overcomes fear of the computer. Simple graphics commands make using the computer fun and exciting for young children.

But it doesn't stop there. Children won't outgrow the Terrapin Logo language. It grows with them. The Logo language includes many features common to artificial intelligence research languages permitting programs of great power to be written quickly and easily. Writing comparable programs in other languages is usually much more difficult and time consuming.

The Terrapin Logo language was developed by the Artificial Intelligence lab at the Massachusetts Institute of Technology. Terrapin is now authorized by MIT to distribute the results of its 12 years of research to you. To provide quality support for the language, Terrapin has assembled a team that includes two of the three authors who developed the Logo language for the Apple II at MIT.

Dr. Wally Feurzeig, the originator of the Logo language, Dr. Sylvia Weir, Dr. Nancy Roberts, and Dr. Paul Goldenberg, who have been involved with the Logo project for many years, think the Terrapin Logo language is so good that they have just joined Terrapin's Board of Educational Directors.

Every copy of the Terrapin Logo language comes with complete documentation. To run the language, a 48K Apple II with a 16K RAM card or a language card, and one disk drive is required.

Terrapin also offers the robot Turtle, and the following books: *Turtle Geometry, Special Technology for Special Children, Mindstorms, Katie & the Computer,* and *Apple Logo* from Byte Books.

Suggested retail price: $149.95
To order or for more information, call or write:

Terrapin, Inc.
678 Massachusetts Avenue
Cambridge, MA 02139
(617) 492-8816

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CIRCLE 205 ON READER SERVICE CARD

Peripherals Plus Extension Units Improve Your Apple II

EZ Port

E Z Port extends the game I/O port to the outside of your Apple II so that you don't have to open the computer when switching from paddles to joystick, VersaWriter, etc.

E Z Port goes beyond just extending the I/O. We utilize ZIP (Zero Insertion Pressure) sockets. With ZIP sockets, you plug in a 16 pin DIP plug and throw a small switch which engages the connections within the socket. *No stress* is exerted on the 16 pin connector until the switch is thrown.

Ordinary DIP sockets are not designed to be used over and over—eventually they won't make contact. Also repeatedly stressing a 16 pin connector will cause pins to snap off. So, E Z Port will not only *outlast* other I/O extenders, your paddles, VersaWriter and joysticks will last longer too!

Installation is easy: Plug E Z Port's cable into the game I/O, run the 24" cable to the outside of the computer, then peel the protective paper from the special adhesive strip and attach E Z Port to the side of your Apple II. Now making I/O changes will be quick, easy and safe!

Only $24.95. Ordering information below.

Select A Port

Like the EZ Port, the Select A Port extends the game I/O port to the outside of your Apple II. However, the Select A Port also allows you to permanently plug in up to four peripherals simultaneously. It consists of five switchable I/O ports. The first socket directly parallels the game socket in the Apple. It can be utilized for sensitive devices for which diode isolation would interfere. (There is a switch provided for future expansion and this socket will override the other four). It is mounted in a 6" x 2 3/4" x 1/2" sturdy high impact plastic case. You simply switch on the peripheral to be used (joysticks, paddles, VersaWriter, etc.) and you are ready—no plugging or unplugging of delicate 16 pin connectors. You save wear and tear on your peripherals, your Apple II, and your nerves.

Dual Joysticks

With the Select A Port you can also use two joysticks simultaneously. The Apple II has the capability to read more than just two game controllers (paddles). The second I/O port on the Select A Port is cross wired so that it can be reversed and will read Paddles 2 and 3. Just plug another joystick into any of the remaining three ports and enjoy dual joystick operation. Dual joysticks and no more hassles with connectors. Only $59.95.

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Peripherals Plus

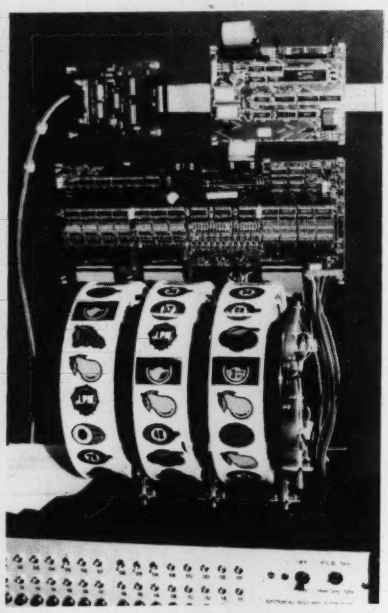
*N. J. residents add 5% sales tax.

Through Fog, continued...

Arcade and Amusement Games Show

We were fortunate that the National Exposition Centre which housed the Which Computer? Show also was hosting the Amusement Games Show the same week. Hence, we were able to get a firsthand look at the new coin-op games that will be coming out in 1982.

One of the hits of the show was Dribbling, a two-player soccer game from Model Racing, an Italian design firm. Model Racing also introduced Thunderbird, a variation of Falcons, and Scramble, a Defenders-type game with many extensions and variations.



New slot machines are electronically operated. This one demonstrated how different payoffs can be set by the operator.

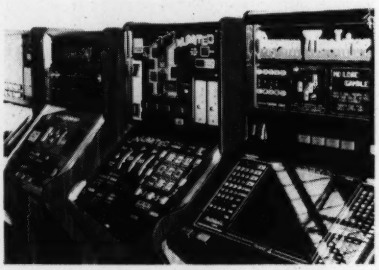
Konami, a Japanese company, introduced three new games with rather different concepts of play. Guttang Gottong is a game in which you guide a train around a maze of track trying to reverse the color pattern as well as get the Crazy Trains to crash into one another. Amidar calls for good logic as you try to surround blocks on an uneven grid while avoiding the mean little Amidars. Tutankham is a treasure hunt game.

Universal introduced two new games which we predict will be big winners: Snap Jack and Ladybug. In Snap Jack the player uses a joystick to control a car on stilts travelling from left to right. The car must eat fuel dots while avoiding various hazards such as rockets, birds, open bridges, wolves, etc. Ladybug is a Pac-Man variation with a major change; in particular, portions of the maze rotate and can be used as barriers to the predatory insects chasing the ladybug. Both of these games use spectacular color graphics and sound to good advantage.

MicroCasino is an electronic betting machine which can be set up to play five different card games.

Other big news at the show was the proliferation of cartridge-type coin-op machines. The front panel generally has a joystick and two or four buttons. Each game cartridge comes with overlays for the controls and sign panels for the machine so it can be changed in a matter of minutes to a completely new game. Rip-offs of all the popular coin-op games are available in cartridge form at a fraction of the cost of a new game.

We're in the process of editing a book, *The Creative Computing Guide to Video Arcade Games*, to be published by Pocket Books in a month or so. Look for it on your favorite paperback rack. □



Electronic slot machines have no pull levers but rather have an array of buttons which allegedly allow the player to "nudge the wheels.

Be sure to vote for your favorite software packages. See page 216.

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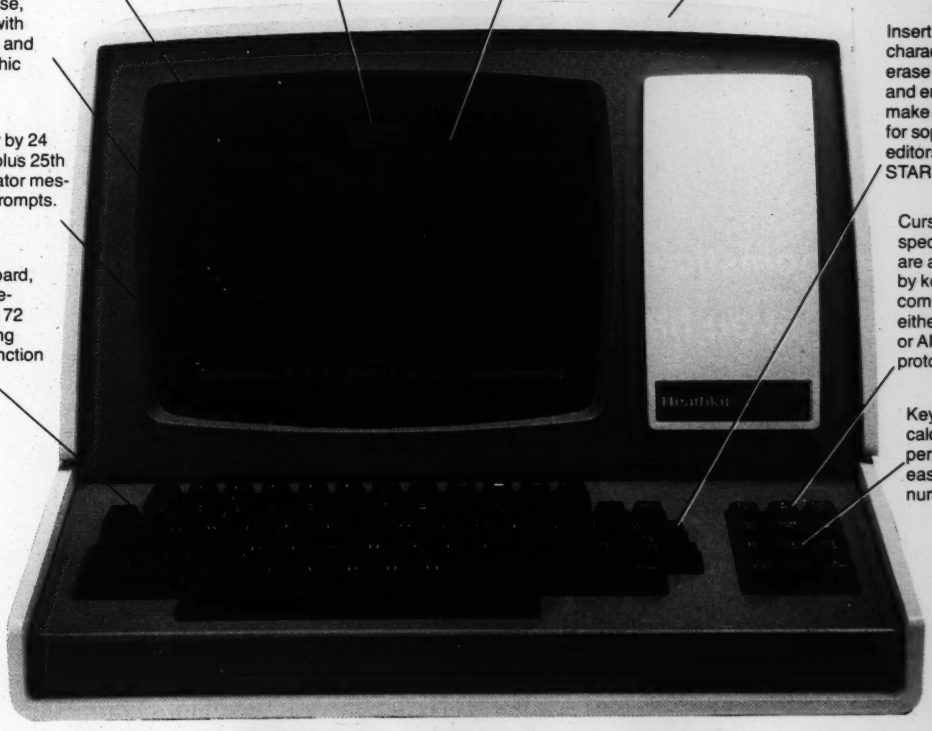

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Logo Ideas

Robert Lawler

Make It Your Own

A six year old was introduced to the INSPI procedure below. When she saw it executed with these variable values, [INSPI 10 0 1], she declared that it looked like a "seahorse" and asked if she could have a seahorse procedure of her own. (I coded for her the equivalent SEAHORSE procedure.) Her "SEAHORSE" procedure was one she explored with considerable interest and satisfaction for several days, delighting in the pretty designs she discovered:

```
TO INSPI :DISTANCE :ANGLE :CHANGE
1: FORWARD :DISTANCE                    Seahorse 7
2: RIGHT :ANGLE
3: MAKE "ANGLE (:ANGLE + :CHANGE)
4: GO "1
```

Seahorse 1

```
TO SEAHORSE :CHANGE
1: MAKE "ANGLE 0
2: FORWARD 10
3: RIGHT :ANGLE
4: MAKE "ANGLE (:ANGLE + :CHANGE)
5: GO "2
```

It was important to this child to make the procedure her own because it put limits on how much complexity she had to cope with. She didn't have to worry about other people's procedures or how they related to hers. She created her own little world where she was free to explore and develop her own ideas.

Making things your own limits the problems you face at one time. It also serves to make you more independent. You can use your own procedure whatever way you want. You can become as certain as you need to be about how your procedure behaves. You can change your procedure without doing something unexpected to anybody else. But greater independence has its problems. You may get frustrated when your procedure doesn't work the way you think it should; you may have a harder time explaining your own procedure to somebody when you ask them for help. Even if you begin Logo by copying others' procedures and changing them to be exactly what you want them to be, you will soon go from changing other people's procedures to making your own procedures from scratch.

Robert Lawler, Ph.D., Associate Director, Logo, P.O. Box 1551, Ansonia Station, New York, NY 10023.

Can I Make Logo Commands?

Any procedure you write is a new Logo command. In this first sense, the answer is "yes" and obviously so. On the other hand, if you write a procedure whose only function is to print "FOO", that would clearly be of a different stature from the Logo primitives, such as RIGHT and FORWARD, mainly because it won't do much for you. Do you *need* more "Logo commands?" Do you have enough experience to know what you need? Hardly anybody can answer "yes" very positively to such difficult questions as these. The way to find out if you need more Logo commands is to look at what you do and the procedures you've coded. Ask yourself: are there sequences of repeated instructions in procedure after procedure? Are there tests of data conditions applied time after time? There probably are. Here is an example of a command you might find a valuable addition to Logo:

PURPOSE: when programming with lists, most frequently iteration is terminated by testing a data condition; for example, the list is empty so no more processing can be performed on its members. It would be useful to have a predicate which directly reports whether a list is empty or not. Such a one could be encoded this way:

```
TO EMPTY? :LIST
IF :LIST =[] OUTPUT "TRUE
OUTPUT "FALSE
END
```

PURPOSE: when programming with lists, very often you want to know if a specific item is a member of a list. The MEMBER? predicate will answer that question.

```
TO MEMBER? :ITEM :LIST
IF EMPTY? :LIST OUTPUT "FALSE
IF :ITEM = FIRST :LIST OUTPUT "TRUE
OUTPUT MEMBER? :ITEM BUTFIRST :LIST
```

The gain in your programming from using such a new command may appear a small one, and so it is. But small gains add up to significant advances. Easy extensibility is a key feature of the Logo language. Using that feature to simplify your own coding will enable you to code more complex procedures and understand them better. □

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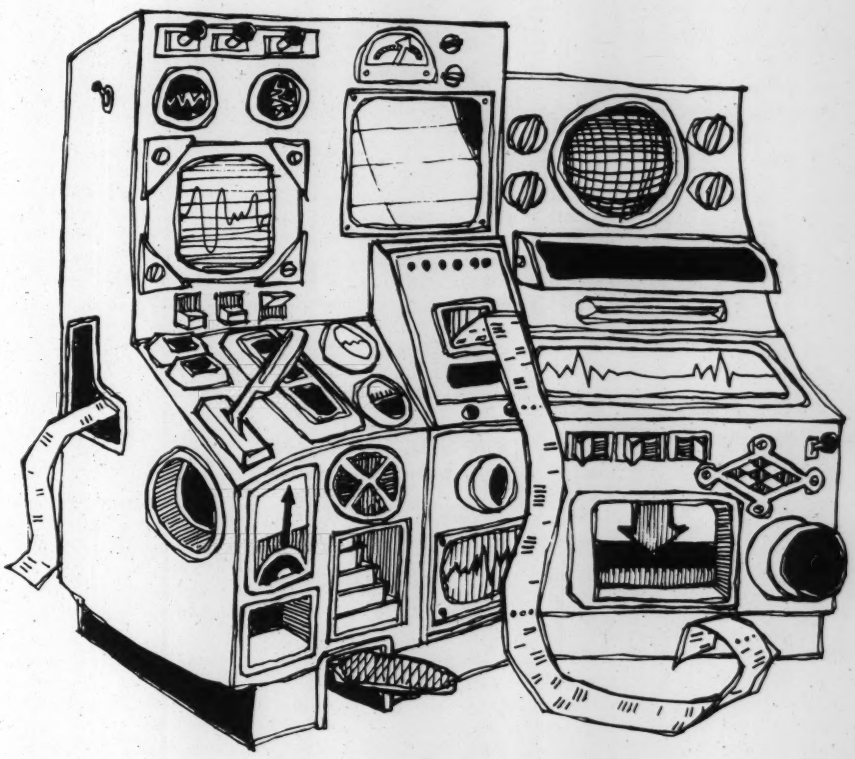
A Brief History of The Front Panel

Philip Hooper



Everyone knows that without programs computers are useless, except perhaps as sculpture or paperweights. Computers need programs! Early computers used programs that were stored outside of memory; instructions were brought in, one at a time, and executed. Fetching an instruction might require more time than processing it—much more time. However, once programmed the computer itself needed no additional priming before it was ready for work. It was like a hardwired interpreter, patiently waiting for a line of source code to process, and reprogramming was a very tedious chore.

When John von Neumann* envisioned a scheme with programs stored internally, along with and virtually indistinguishable from the data, a revolution was sparked. The program, formerly embodied as a paper-snake-tape gradually being devoured by the mill, or as a plugboard crawling with patchcords—truly a tray of worms—became obsolete in that flash of genius which spawned the stored program computer. Suddenly it was even possible to create programs which could modify themselves, a capability which opened the door to undreamt of elegance, deviousness and agony, in addition to inspiring some rather imaginative fiction about self-programming computers "taking over." At the same time, the question "how do we get the program in there in the first place?" assumed critical importance.

At any given time the signals presented at the pins constitute only a small fraction of the interesting signals throbbing within the chip.

Enter the front panel, to become as essential for proper computer function as a massive air conditioner and three-digit-ampere power supply. This front panel provided the cartoonists with an image that guaranteed instant recognition. Oh, yes, the whirling tape drives were important, but far more arresting were those rows of twinkling lights and little switches, the very devices which let a person "talk" with the machine and listen/look to/at it.

Indeed, beyond the hard line of brute soldering iron and on-off-reset switch, this array of tiny red eyes and noses was the main line of communication between the two species: the one aging, biological, transforming resources into garbage; the other emerging, electronic, transforming information into garbage. The lights showed us what was in there, and the switches let us change it. But it was tedious business, toggling in data one bit at a time, and

Historical Note: While von Neumann generally gets the credit for the idea of the stored program, veterans of the original ENIAC project, and particularly Dr. John Mauchly himself, have firmly stated that Von Neumann got the ideas from them—Ed.

Philip Hooper, Box 62, Northfield, VT 05663.

would never be suitable for loading any program large enough to be useful.

Oooops! That is not quite true, for there was one program, or rather class of programs, small and yet very useful indeed, for once they had been loaded they proceeded to load in the large programs. These programs, the bootstrap loaders, provided the essential link through which man could use an agonizingly slow input procedure to load (eventually) a very large program, quickly and with very little human effort. Numerous analogies come to mind—a photomultiplier tube, a kick-starter, an avalanche, a fission reaction, a seed. Together, the front panel and bootstrap combined to provide an effective way of utilizing the conceptual breakthrough of the stored program computer—they got the program inside where it could *be* stored.

The front panel had other functions besides helping us load and activate the "strap." It gave us a way to examine things, important things like the contents of the CPU registers. Since these registers were composed of discrete components, their individual bits were directly available on wires, and through the switch settings an assortment of these bits could be selected for representation on the lights. (This is not easy to do with a microprocessor chip (MPU), since at any given time the signals presented at the pins constitute only a small fraction of the interesting signals throbbing within the chip.) Moreover, the front panel could use hard-wired interrupts to provide a single-step feature, allowing the behavior of a program to be examined in great detail, within a human time-frame. Address and instruction traps could also be provided, to let the operator/programmer run his program until his own specific conditions were met, a capability of great value during debugging.

Enter the ROM. Suddenly we had a way to mass produce a program cheaply, on a tiny chip, and store it in a computer memory by simply plugging it in. Surely that was the way to implement the bootstrap loader, whatever device it was loaded from. Load the "strap" just once, in the infancy of the computer, and use it for all program loading from then on.

We no longer even needed a front panel, since the reset button could be wired to activate the ROM bootstrap, letting us load our programs automatically. Besides, with the entire CPU now cased in a plastic dominoid quatrodecipede instead of spread over a few yards of discrete circuitry, we couldn't even get at some of the signals that used to be so handy and useful. If we wanted to inspect, say, the low nibble of some register, we would now have to convince the MPU to bring it out on pins, where we could access and display it. But the instructions causing the MPU to do this would almost certainly change the very register to be examined, a fact forcing us to store all of the register information outside the MPU first, and then restore it to the MPU registers after our examination was over.

The black-box boundary of the black chip design sets limits to what we may know about the inner workings of the chip. For the convenience of tidy, swift, integrated packages we trade the ability to investigate the infrastructure, just as the convenience of an automatic transmission costs us the freedom to select, when appropriate, some specific gear ratio. We cannot bring out an index register for examination without also changing the accumulator and status register and bringing about frantic activity on the address lines. We cannot open up the chip to make minor alterations in its behavior or to resolder a troublesome connection any more than we can, in Basic, use a data value as a program address. Indeed, is the convenience, the simplification, worth it?

The black-box boundary of the black chip design sets limits to what we may know about the inner workings of the chip.

Well, if we no longer need the front panel for loading programs (we don't), and if the hardware cost of bringing extra signals out of the MPU are not justified (they are not), then why have a front panel at all? Let the cartoonists find another recognition archetype, and build instead a sleek box with one switch, one push-button, and one line cord.

Compared with something which "looks like a computer," this streamlined box would be far less threatening to small businessmen, large businessmen, majority groups, history majors, and sundry technophobes. Only pinball addicts would sense a loss. Is it not somewhat surprising that the typewriter ever "took hold," considering how much more complicated and technological it looks than, say, an ink pad and box of hand type. And, by the way, *was* the increase in speed worth it?

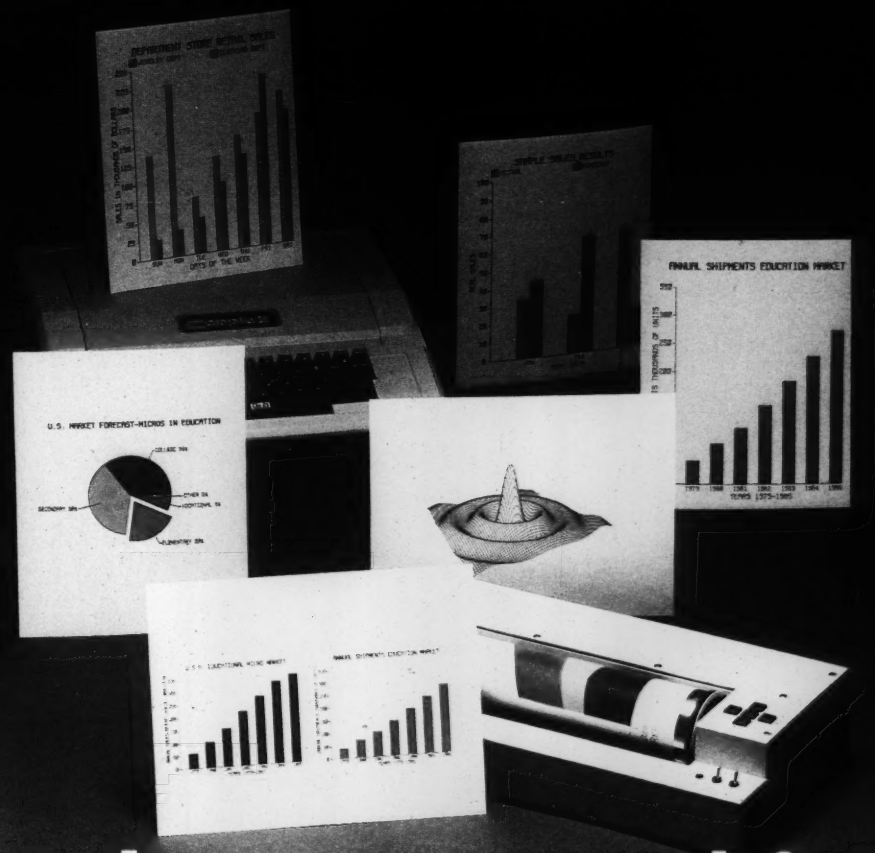
In fact, the front panel has faded into history, after emerging to provide vital support for Von Neumann's inspiration and serving well as a flipping, blinking coupler between man and machine during those critical years in which the increasing complexity of machines outstripped the ability of their creators to use them well or understand them fully. Now that these new creatures, computers, have helped us learn how to provide them with ever-present, everready internal programs, the job of the front panel is essentially over. As Ludwig Wittgenstein, at the end of his *Tractatus*, remarked about the proper use for his own philosophy: having climbed the ladder, one throws it away. Although slow, the front panel did contribute greatly to the development of the modern computer, only to be sacrificed, when expedient, to the God of Speed.

It is unfortunate that the availability of better (ROM) loaders has cost us the other front panel features as well, but it is impossible to justify the expense of supporting this register-level control and debugging capacity, except in a few very expensive installations for program development. However, there is an alternative approach—one which offers a reasonable compromise between function and cost by using software to simulate the MPU and then operating on the resulting model, using it to execute a target program interpretively. This approach can avoid *any* additional hardware cost and complication by using the capabilities of existing I/O devices. It can model the front panel lights on an existing CRT (no doubt providing a richer alphabet than binary blink) and can interpret the switch closures of an existing keyboard as if it were sensing front panel switches.

Execution under the resulting system will be slower than direct execution, but will be brought completely under the control of the user, whether in single-step mode or running subject to halt/trap conditions. Moreover, while the *model* of the MPU is being manipulated by software running the *actual* MPU, every bit of every register of the machine model is immediately accessible for examination and alteration.

Through this model approach, the internal logic of the MPU chip is spread out in some region of R/W memory where each "wire" may be accessed conveniently and independently. The tidiness and speed of the blackbox chip are gone, traded for a cumbersome but transparent room that is crammed full of useful, interesting junk. Control over program execution is returned to the programmer. Direct communication with the MPU registers is possible once again. Though the hardware front panel is gone, a "front panel" in software is able to take its place. The front panel returns. □

A software system to implement this scheme has been written for the OSI C4P computer. Called Soft Front Panel, it is available through Technical Products Co., Box 12983, Gainesville, FL 32604. If enough interest is evidenced, it may be modified for other 6502-based systems as well.



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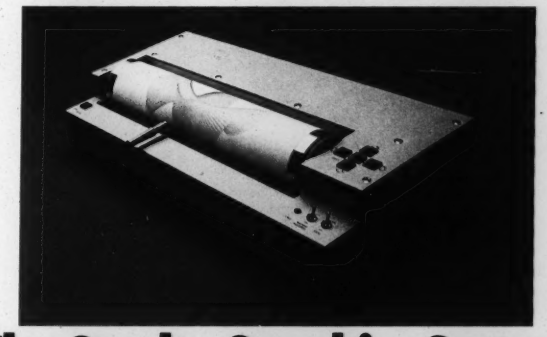

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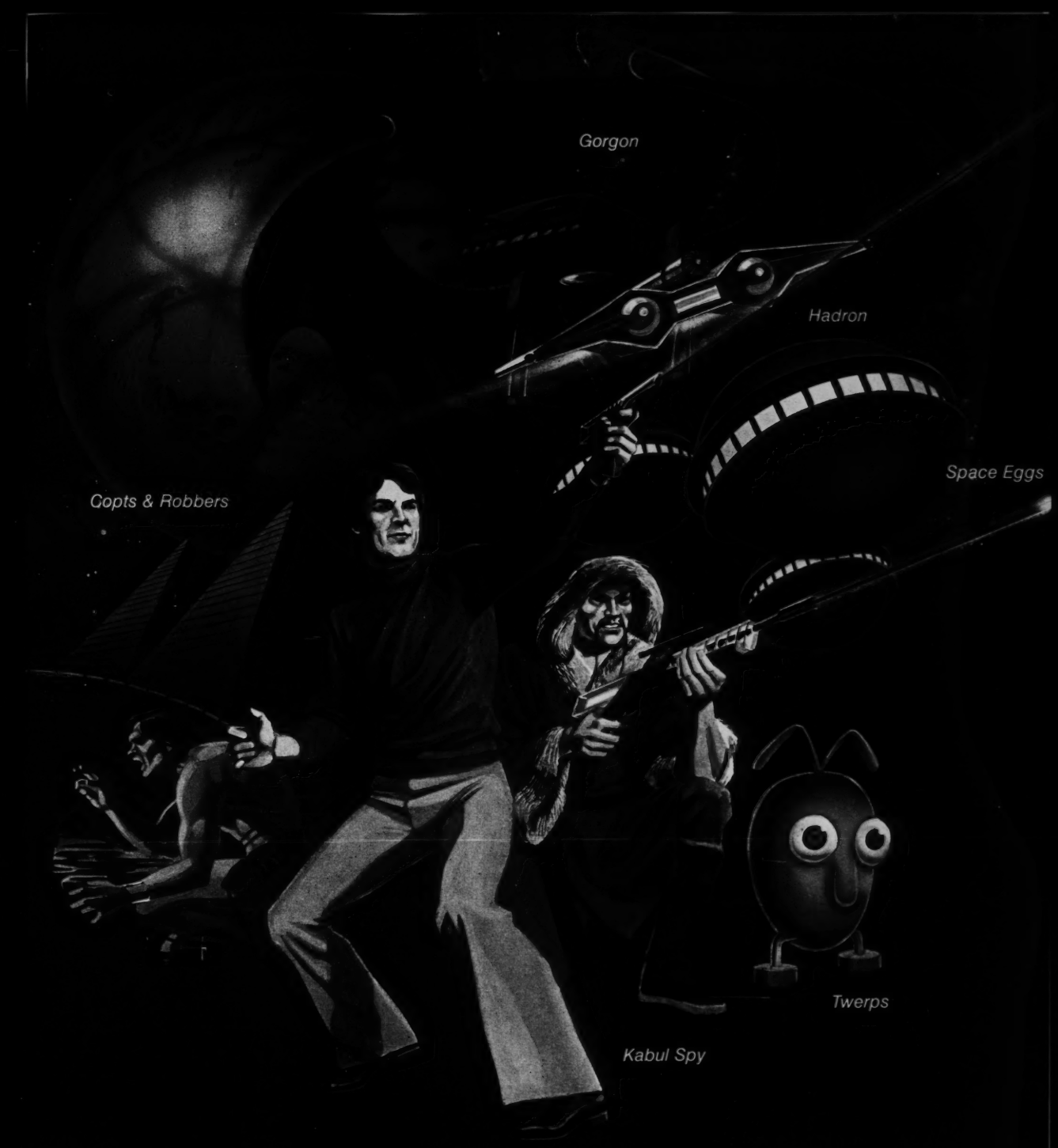

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Barbara Garris

Last summer saw the blossoming of the "Computer Camp" phenomenon. We've put together a listing of residential and day summer programs for children and adults. If you know of any programs that are not listed here, please let us know.

East Coast

Computers for Kids Day Program, Creative Computing Education Center, 39 East Hanover Ave., Morris Plains, NJ 07950.

This non-residential day summer program teaches young people aged 10 to 17 microcomputer concepts and Basic programming, beginners to advanced level. Two-week courses run from June 28 through August 20. Contact Barbara Garris, manager, Creative Computing Education Center, 201-540-0445, for registration information.

Computer Camps International, 310 Hartford Turnpike, Vernon, CT 06066.

Computer Camp East, renamed Computer Camps International, is offering two new two-week residential programs in Denton, TX and Whitewater, WI, as well as their original East Haddam, CT program. Day programs are also planned. For more information, call Mr. Michaels, director, 203-871-9227.

National Computer Camp, Box 624, Orange, CT.

The original residential/recreational computer camp concept of Michael Zabinski is alive and well in one- and two-week sessions at Westminster Preparatory School, Simsbury, CT and Woodward Academy, Atlanta, GA. For more information, call Michael Zabinski at 203-795-3049.

Wesleyan Summer Computer Institute, 92 St. Botolph St., Suite 3, Boston, MA 02116.

This two-week or seven-week residential program mainly for adults at Wesleyan University, Middletown, CT, also provides low-cost campus housing. Credits toward a Master's degree can be earned if the course is successfully completed. For starting dates and registration information, call Russ Walter, director, at 617-266-8128.

Midwest

CompuCamp, 7101 York Avenue South, Edina, MN 55435.

Held at Bethel College as well as other midwest campuses, this residential computer/sports/recreation program takes young people from 10 to 17. One-week and two-week courses are available starting June 16 through August 6. For more information call Kathryn Thomas, director, at 612-835-0064.

Lake Forest Computer Camp, Sheridan and College Roads, Lake Forest, IL 60045.

One-week intensive courses in Basic will be offered on the campus of Lake Forest College, 30 miles north of Chicago. The 1982 season runs from June 20 to August 6, and is open to children between the ages of 12 and 18. Contact Lowell Carmony at (312)234-3100.

West Coast

Computers for Kids, Inc. and Computers for Grownups, 8 Benton Ct., #4, Tiburon, CA 94920.

Weekend residential computer and recreational programs for adults and children are offered periodically in the central California area through winter and spring. A summer computer/recreation/sports program for young people is planned. For more details, call Robin Samuel, director, at 415-435-1310.

Computer Camp, Inc., Suite G, 1235 Coast Village Rd., Santa Barbara, CA 93108.

This Southern California residential/recreation/sports camp for young people 10 to 18 runs two-week cycles starting June 11 through August 20. Call Garry White, director, at 805-969-7871 for more information. □

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CIRCLE 153 ON READER SERVICE CARD

WH Smith Brings ZX-81s to the High Street

Tim Hartnell

AFTER RELYING on mail order for 18 months, Sinclair Research has ventured into the retail field — via the giant newsagency chain, W H Smith. In 112 stores, Computer Know-How centres feature displays based around an operating ZX-81 which is backed up by computer magazines and books.

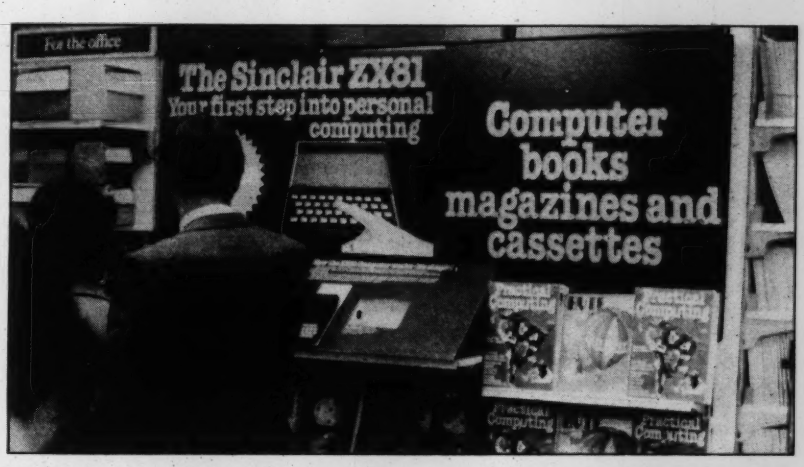
The agreement, which began in September, is for a trial period of 12 months. "Both parties view the agreement as an experiment", says Clive Sinclair, inventor of the ZX-81. "We accepted Smith's approach because they've clearly researched the subject carefully, and take the new operation very seriously".

Under the sales contract, W H Smith has established the computer departments in its stores, and although the company is selling a wide range of computer books and magazines, it is staying away from hardware — except for the ZX-81.

W H Smith has made the move into the computer field after its success with computer books and magazines. For several years, the only place you could find computer books was in specialist computer shops. Then, the retail chains discovered the appeal of computers and began to stock the magazines. Now, few of the specialist stores bother to stock the British monthlies, relying instead on issues of U.S. magazines and books. The same is unlikely to happen with computers, because both W H Smith and Sinclair Research believe they will be tapping a whole new market — one which would not consider buying by mail order.

John Rowland, W H Smith market-development manager, said the company had decided to approach Clive Sinclair for the rights to sell the ZX-81, because Sinclair Research was the only company with "both a proven product available in the right quantities, and a proven sales record.

"Last year we started a small experiment with computer books and magazines", says



Rowland, "and it worked well. So what we've done now is bring the computer-orientated publications together with an actual computer, to create the Computer Know-How section of the store".

Growing Market

The first test market for computer products was the W H Smith store in the Brent Cross Shopping Centre. "We sold a good deal of books there", Rowland recalls. "We thought that we were at the beginning of something important, and that with suitable hardware, we'd have a combination which would prove successful".

Rowland says that the traditional strengths of W H Smith in selling books and magazines had increased in recent years with the development of the record and toy departments, the camera and film sections, and the small office and home products such as typewriters and calculators. Computers seemed the next logical step.

"We sell about 500,000 computer magazines a year", says Rowland. "CB is the latest boom, with a new magazine in the field just about every month, but computer magazines are very strong, and we expect this area to keep growing".

W H Smith started in the computer magazine field by importing magazines from the United States: "We had many American magazines", says Rowland, "and they sold very well". He says he found that the home-bred magazines quickly improved out of sight, and the need to import U.S. publications diminished.

As well as the ZX-81 and computer books and magazines, the Computer Know-How section of the W H Smith's stores sell blank cassettes at 50p as well as the Sinclair-produced software.

"We'll look at how the ZX-81 goes, and then decide if we want to carry other machines", says Rowland.

He is aware of the problems some people had had with early 16K memory packs, but says he has been assured by Sinclair Research that the problems associated with the RAMs had been ironed out.

"We'll be providing our own service on the computers, and related hardware", says Rowland. "The machines will be covered by our normal audio guarantee. We normally repair cassette recorders and the like within 24 hours, and we imagine we'll be able to do the same with the ZX-81. Of course, we've had no experience here — time will tell".

Reprinted with permission from *Your Computer*, Quadrant House, The Quadrant, Sutton, Surrey, SM2 5AS England.

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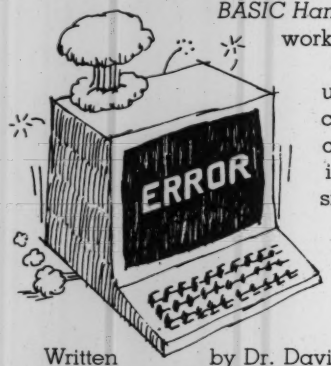

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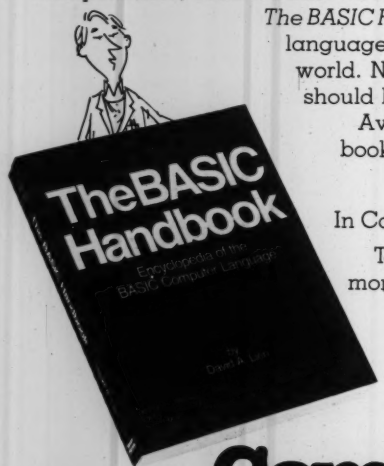

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CIRCLE 125 ON READER SERVICE CARD

ZX-81, continued...

W H Smith has decided that if the ZX-81 experiment works, it could well become a major part of the company's marketing policy in the 1980s. The company believes that its strength in the book and magazine markets places it in a good position to attract potential purchasers of the machine.

W H Smith is aiming to sell as many machines during the five months' retail agreement as Sinclair Research sell in one month by mail order — about 10,000 computers a month.

Bewildering Selection

W H Smith sees the back-to-school and Christmas trading periods as very important for ZX-81 sales. The company expects sales to grow slowly as people gradually became aware that it is selling the computer. Then, when Christmas gift-buying time arrives, W H Smith hopes people will automatically turn to their local branch as the source for the ZX-81.

About 300 W H Smith staff have been trained in the rudiments of the ZX-81. They have been shown how to plug in the machine, attach the 16K pack and the printer, and know the memory requirements of the five cassette software packs on sale. A number of magazines have been moved from the general magazine section to the Computer Know-How departments. These include *Your Computer*, and its sister publication *Practical Computing*.

A number of books — none of which has any particular relevance to the ZX-81 — are also on sale in the special computer areas. Some, such as *Illustrating Basic* and *Introduction to microprocessing* are likely to prove bewildering and worse than useless for first-time computer buyers.

If you are having problems with your mail-order ZX-81, do not try taking it into your nearest W H Smith claiming you bought it from there, and expecting to have it repaired. ZX-81s sold by W H Smith have a WH serial number. Staff have been told not to accept any ZX-81s without this serial number. □

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CIRCLE 114 ON READER SERVICE CARD

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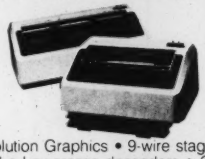

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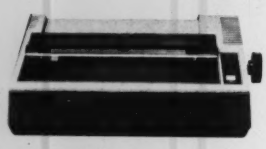

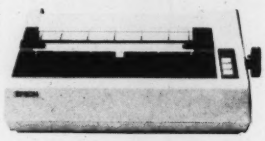

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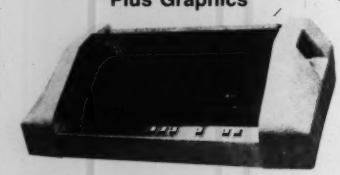

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Using Field Specifiers on the TRS-80

John Adams

The first "big" program that I wrote for my TRS-80 had to do with household budget and expenditures, and it came close to being my last. I had not done much programming and I was still working in Level I. The program slowly and painfully worked out to my satisfaction, except for the printouts. To give you an example of what I was getting RUN the following lines.

Listing 1.

```
1   REM * MONEY PRINTING
    ROUTINE
10  FOR X=1 TO 5:READ P(X):NEXT
20  DATA 254.13,1041.19,42.90,6.00,.79
30  CLS:PRINT"SALES SLIP #",
    "AMOUNT"
40  FOR X=18255 TO 18259:PRINT X,
    "$";P(X-18254):NEXT
```

All of the information is there, but that number column looks downright seedy. I spent a couple of days and almost went berserk trying to line up those miserable figures. Level II, however, offers us some solutions to this problem. It includes a group of "field specifiers" which take a lot of the misery out of generating reports.

As applied to computers, the word "field" has several meanings. If we are creating reports, "field" means an area into which a specific category of data is to be printed. Look at Table 1.

This report has five fields; one for the month, one for food, one for rent, one for utilities and one for the total. The specifiers under discussion allow us to design a pattern or "format" for each of these fields. These formats are stored in memory locations and are called into use by the PRINT USING instruction. An example follows:

```
SALES SLIP #     AMOUNT

 18255           $ 254.13
 18256           $ 1041.19
 18257           $ 42.9
 18258           $ 6
 18259           $ .79
```

Printout of Listing 1.

```
10  A$="###":B=456
20  PRINT USING A$;B
```

Line 10 sets up the format in A$ and loads a value into B. All formats are loaded into string locations. Line 20 is actually a routine which takes the value stored in B and prints it out in accordance with the specified pattern. A semicolon is used to separate the format string name from the data which follows. Notice that the format loaded into A$ is enclosed in quotes. Such patterns may also be loaded by the READ-DATA method (10 READ A$:DATA ###) in which case the quotes are not needed. Formats are composed of various symbols found on the keyboard. Since much formatting is done with numbers we should perhaps start there.

The number or pound sign (#) is used in the format to specify the number of digit spaces needed in the field. Look back at line 10 and you will see that "###" was put into A$. This sets the field length at three. To get a look at what this does, enter and RUN the following lines.

```
10  A$="###"
20  FOR X=1 TO 5:READ
    P(X):NEXT
30  DATA 123,4567,8,-90,7.5
40  FOR X=1 TO 5:PRINT-
    TAB(20)P(X);TAB(40)USING
    A$;P(X):NEXT
```

The left-hand column is printed without the format, the right with the format. Several differences are immediately apparent. On the left all numbers are lined up from the leftmost digit. Actually the positive numbers all begin at tab 21 as a space is left for the "+" sign which is not needed. On the right the numbers (with the exception of the second) are lined up from the rightmost digit. Unless there is some reason not to, this is the way tables of numbers are usually printed.

So why is the second number not lined up properly? And where did the percent sign come from? It is an indication that the field size is too small. Line 10 specified three spaces but the number has four digits. The percent sign tells you so, then goes ahead and prints the entire number anyway. It is out of line because the field cannot contain it. It is therefore prudent to include enough number signs in your format to hold the largest number that you will be using. As we go along you will see that adding other symbols to the format increases the field size. Change line 10 to read A$="####". The percent sign, and the lineup problem, disappear.

Table 1. Breakdown of Expenses.

MONTH	FOOD	RENT	UTILITIES	TOTAL
JANUARY	$221.50	$425.00	$145.89	$792.39
FEBRUARY	$199.58	$425.00	$155.35	$779.93
MARCH	$240.04	$425.00	$139.20	$804.24

John Adams, 13126 Tripoli Ave., Sylmar, CA 91342.

There is also a difference in the last item, which was changed from 7.5 to 8. The format used did not specify that decimals were wanted, so none were furnished, and the 7.5 was rounded up to 8. Regular 5/4 rounding was used here; 7.4 would round down to 7 and 7.5 up to 8. This feature can be used to advantage. When working with decimal numbers we can use a format to round to whole numbers (or any number of decimal places) and this can eliminate one program line.

Decimals may be requested by inserting a period in the format, and its position will indicate the number of places to be returned. Change line 10 to read A$="####.#". The 7.5 is now printed properly, and a bonus is picked up in the "trailing" zeroes following the numbers. More about that in a minute. Changing line 10 to read A$="####.##" will cause the numbers to be printed with two decimal places. You can, by adding number signs to the right of the decimal, get up to 16 decimal places. Be careful with precision, however, as decimal digits may be incorrect after the sixth place unless you have declared double precision. If you are unsure about precision see "Variable Types" on page 1/3 and DEFINT, DEFSNG and DEFDBL in Chapter 4 of your manual.

The bonus that was mentioned has to do with printing money figures. The TRS-80 has a built-in function to suppress trailing zeroes. Enter PRINT 5.0000 and the monitor will return 5. Since the two numbers represent equal amounts the zeroes are not needed. Entering PRINT 5.0001, on the other hand, will return 5.0001. The zeroes are now "significant" as the two numbers are different amounts. In the original money-printing routine, the third and fourth items of data were 42.90 and 6.00 and if you recall these were printed as $ 42.9 and $6. Using a format will guarantee that money columns will have two, and only two, decimal places.

We might also want dollar signs in our money columns. Adding two dollar signs ($$) to the beginning of the format will act as a floating dollar sign which will print immediately to the left of the first digit.

The comma is useful in printing large numbers. It is easier to read 12,345,678.90 than 12345678.90, as we are accustomed to seeing large numbers divided into periods of three. Inserting a comma any place *after* the first number sign and before the decimal will do this for us. Only one comma is needed; the computer will then put commas in front of each group of three digits.

```
1  REM * REVISED MONEY PRINTING ROUTINE
5  A$="$$#,###.##"
10 FOR X=1 TO 5:READ P(X):NEXT
20 DATA 254.13,1041.19,42.90,6.00,.79
30 CLS:PRINT"SALES SLIP #", "     AMOUNT"
40 FOR X=18255 TO 18259:PRINT X,USING A$;P(X-18254):NEXT
```

Listing 2.

Using these four symbols (number sign, period, dollar sign and comma) we can polish up that first routine. The revised version is shown in Listing 2.
Note the differences from the original version in lines 5, 30 and 40. The addition of the four spaces before the word AMOUNT in line 30 is to adjust the column heading. There is a better way to do this which will be discussed later.

If the computer is used to print checks or other numbers that could be altered, using a pair of asterisks in the format will fill in any unused spaces in the field with stars. The following lines illustrate:

```
10 A$="######,####":B$=
   "**#####,####":A=1234
20 PRINT USING A$;A
30 PRINT USING B$;A
```

The asterisks and the dollar sign can be used in conjunction. Change line 10 so that B$ reads "**$###,###". For this format only one dollar sign is used (**$). You should be aware that adding asterisks, dollar signs, periods, etc., increase the field size. There are now eleven characters in the B$ format, so that field could contain a dollar sign, eight digits and two commas. Again, be careful with precision.

Just as the TRS-80 suppresses trailing zeroes, it also omits the "+" sign in front of positive numbers. Should you need such signs they can be incorporated into the format. An example is shown in Listing 3. RUN this and notice that the leading signs are positive and negative as the occasion demands. Putting the plus or minus signs at the end of the format will cause them to be printed as trailing signs. See page A/7 of the manual.

The last of the number formatting signs is the "up" arrow, normally used for indicating exponentiation. Including four such arrows at the end of the format will cause printout in exponential or "scientific" notation. Such notation is used with very large or very small numbers and expresses them more compactly as small groups of significant numbers times powers of ten. If you have need for such numbers you probably know what they are and how they work. For more information consult any math reference book.

Up to this point we have been dealing with formatting numbers, but there are two symbols that can assist in formatting strings. Remember that strings can contain any mixture of letters, numbers and symbols. The first of these signs is the exclamation point and it is used to excerpt the first character of any given string. RUNning the following will return the letter A.

```
10 A$="ABCDE"
20 PRINT USING "!";A$
```

If such a format will be used frequently it can be stored in a variable location and called when needed as in the following.

```
10 A$="ABCDE":Z$="!"
20 PRINT USING Z$;A$
```

Two or more exclamation points may be used in combination and spaces can be included before, in between and following the points to establish the string field. RUN the following example.

```
10 A$="ABCDE":B$=
   "12345":Z$="  !  !  "
20 PRINT USING Z$;A$,B$
```

This creates a string field in Z$ which contains two spaces, the first letter of the first listed string, two more spaces, the first letter of the second listed string, and then two more spaces. The printout therefore reads space-space-A-space-space-1-space-space. This is handy for creating acronyms from titles, such as CBS from Columbia Broadcasting System.

The second of the symbols is the percent sign (%). Using a pair of these will establish a string field size of 2 *plus* the number of spaces included in between the signs. This allows us to lift any number of characters from a given string, starting from the first character. Try the lines in Listing 4.

Listing 3.

```
10 A$="+##.#"
20 CLS:PRINT"TEMPERATURE DEVIATION FOR MAY 1 TO MAY
   10":PRINT
30 PRINT"DATE", "AVERAGE","TEMPERATURE","DEVIATION"
40 FOR X=1 TO 10:B(X)=RND(10)+80:C=C+B(X):NEXT:D=C/10
50 FOR X=1 TO 10:PRINT"MAY";X,D,B(X),
60 PRINT USING A$;B(X)-D:NEXT
```

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CIRCLE 170 ON READER SERVICE CARD

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*Requires Z-80 Softcard.

```
10  READ A$,B$,C$:DATA JANUARY, FEBRUARY, MARCH
20  Z$ = "% %":CLS:PRINT "TOTALS";
30  PRINTTAB(20)USING Z$;A$;
40  PRINTTAB(30)USING Z$;B$;
50  PRINTTAB(40)USING Z$;C$
```

Listing 4.

The field in Z$ is set to three, so the first three characters of each listed string are returned. Note how PRINT USING is used with PRINTTAB. It works equally well with PRINT@, but in this case a comma is inserted after the location number as in PRINT@50,USING Z$;A$. A short routine which involves both of these symbols is shown in Listing 5.

Line 10 sets up two string fields. In Y$ the percent signs define a four space field which will pick up the first four characters of the indicated string. In line 50 therefore, the word THE with its trailing space will be printed. In Z$ the second field contains three characters consisting of the first letters of the three strings indicated.

As a final exercise let us go back to the revised version of the money printing routine. Remember that we added four spaces before the word AMOUNT in line 30. We did this to move our column heading over to correspond with the money column. Since a comma was used as a position indicator before the word AMOUNT, it printed out starting in the first space of the second screen zone, or in space number 17. Also recall that when we define a field, the item in that field will be printed out with the *last* character in the rightmost position of the field. Look back at line 10 and count the characters in the field format stored in A$; 2 dollar signs, 6 number signs, one period and one comma for a total of ten. There are only 6 number signs, but a space in the field has been added for each additional symbol. So any data in that field will be printed with the last character in position 27 (17 plus the 10 in the field). To line up the column heading we took the number of letters in AMOUNT (6) and added the four leading spaces so the string field size was also 10.

This string field can be defined at the beginning of the program along with the number field. Change line 5 to read: 5 A$ = "$$#,###.##":B$ = " % %". The field in B$ now has 10 spaces. In printout the first four will show as spaces, and the percent signs will then put the first six characters in the word AMOUNT (all of them) into the end of the field. This gets our heading lined up. The printout line must also be changed and should look like this.

```
10  Y$ = "%  %":Z$ = "!!!"
20  READ T$,F$,B$,0$,I$
30  DATA THE ,FEDERAL ,BUREAU ,OF ,INVESTIGATION
40  PRINT T$;F$;B$;0$;I$;"IS SOMETIMES CALLED"
50  PRINT USING Y$;T$;:PRINT USING Z$;F$,B$,I$
```

Listing 5.

```
30  CLS:PRINT"SALES SLIP #",
    USING B$;"AMOUNT"
```

As we can see the field specifiers are a versatile lot. Experiment with them. Once you have the hang of them, your reports will really get that professional look. □

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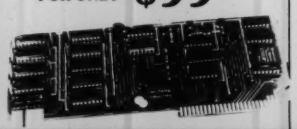

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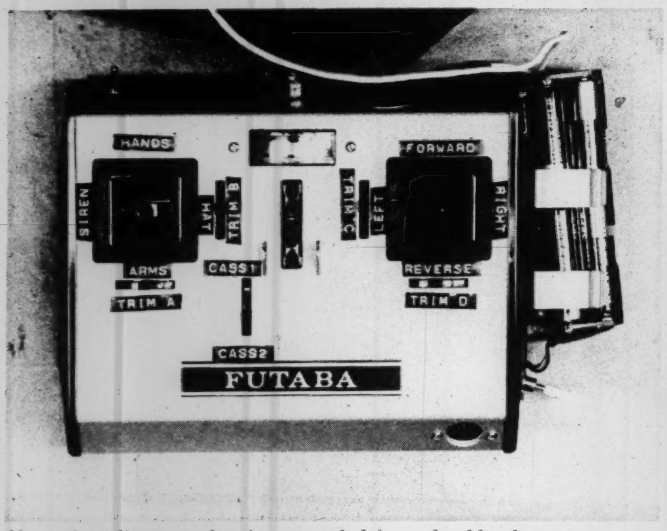
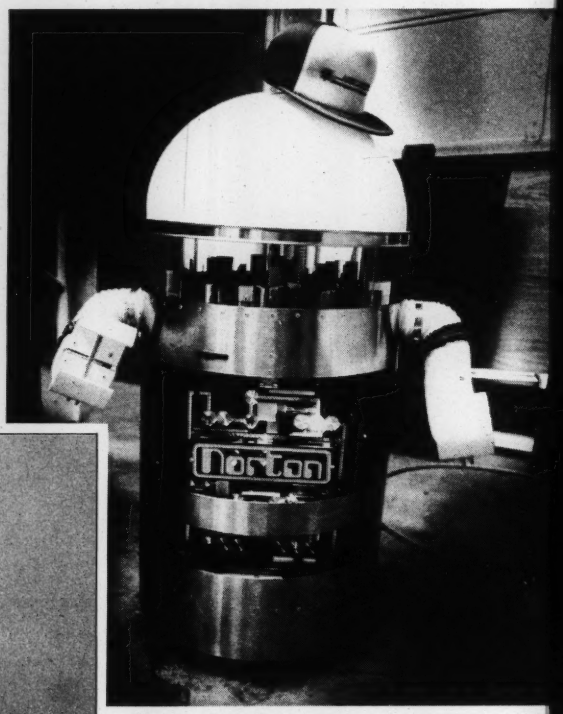


Norton's radio control unit, concealed in a shoulder bag, directs his movements.



Norton the robot.

If you have ever attended a computer show, you have undoubtedly met one of the cheeky little mechanical fellows who ply the aisles attracting attention for their renters' products.

"Obviously," you have said to yourself, "it can't be a 'real' robot. But how does it work?"

Here is a closer look that should answer the question.—EBS

Norton is a radio-controlled robot operated by Laser Systems Development Corporation of Colorado Springs, as a promotional gimmick for their laser and light shows.

Powered by a motorcycle battery, the robot rolls with motorized wheels, moves his arms and claws, flashes lights in his opaque dome, raises and lowers his hat mounted on an antenna, and plays music through a cassette deck.

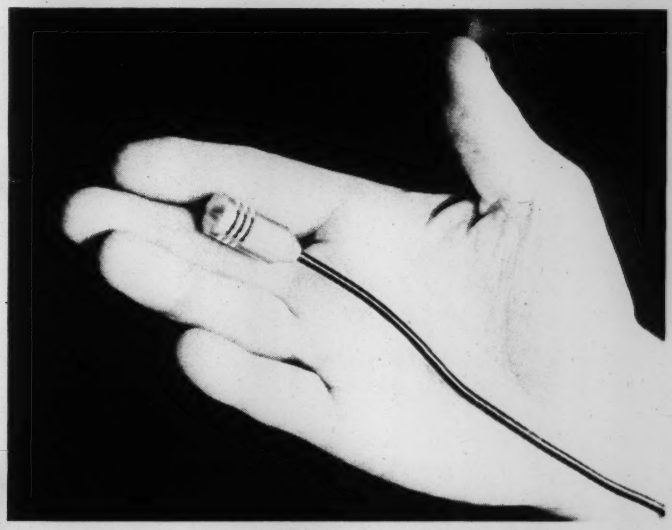
Norton is remotely controlled with a modified model airplane control box, which is concealed in a leather shoulder bag.

Peter Shriner, 5262 Reed St., Arvada, CO 80002.

← CIRCLE 186 ON READER SERVICE CARD

the Robot

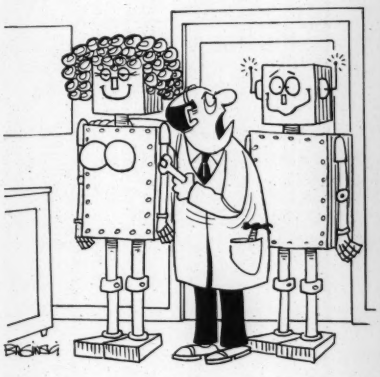
Unnoticed by curious spectators, Jim Wiley (left) and Ron Webster (right) maneuver Norton.



A tiny radio microphone hidden in the operator's palm is Norton's voice.

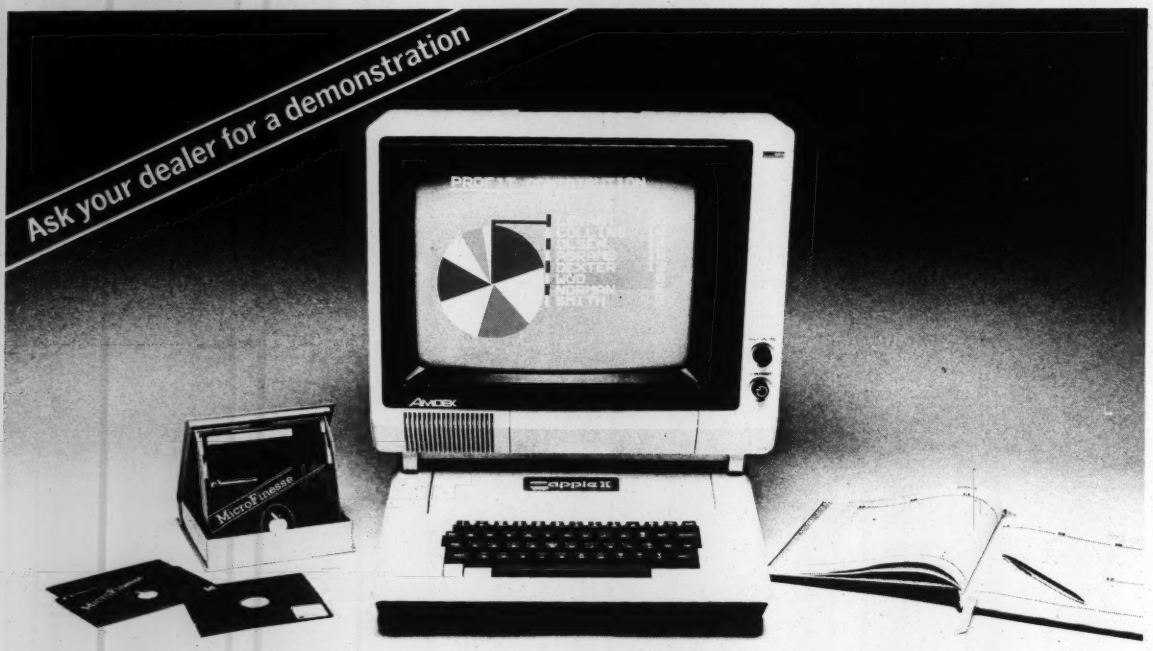
The operator(s) also make him speak with a radio microphone.

Norton has an effective operating range of 30 feet, enabling the operator to control him in a crowd without being noticed. An operator can make the robot approach any individual in a crowd and carry on a conversation, much to the amazement of spectators. □



"I am hurrying!"

CIRCLE 226 ON READER SERVICE CARD →



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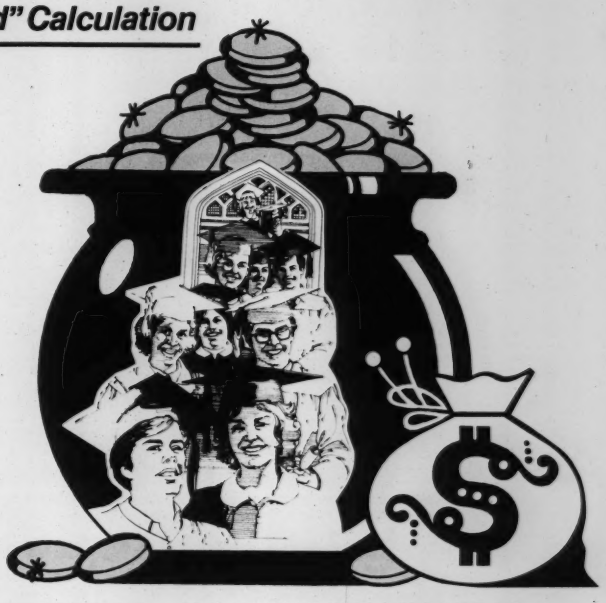
CIRCLE 217 ON READER SERVICE CARD

A Program to Perform the Complex "Need" Calculation

Financial Aid



John B. Fisher

As a college financial aid officer, I am frequently asked by students and their parents about eligibility for student aid. Often, parents will tell me their income and ask if their child is eligible. I must then explain that the answer depends on many factors in addition to income and that the calculation is too complex to carry out on the spot.

The best way to find out if one is eligible is simply to apply, using all the forms required at a particular college, and wait for an official answer. The problem is that this wait is usually at least two months. At a time when a student may need to make college decisions quickly, it would be helpful to get some idea of student aid eligibility right away.

What You Can Learn

The program presented here will tell a student a good deal, although not everything, about eligibility for student financial aid during the 1982-83 academic year.

Specifically, it will calculate the amount the family will be expected to contribute to the student's education, according to the "uniform methodology," the most widely used measure of ability to pay for college.

Most financial aid is limited by need, which is defined as the cost of education minus the expected family contribution. Since most colleges calculate family contribution with a formula identical or very similar to the one in this program, the figure the program provides should be a good approximation of what any college will expect.

The cost of education, however, varies widely from college to college. The figure includes tuition, fees, dorm charges for resident students and an estimate of the amount required for books, transportation and personal expenses. The amount can be as little as under $1,000 per year at a two-year community college to well over $10,000 per year at a four-year independent college.

The best way to find out the cost of education is to contact the financial aid office at the college in which the student is interested.

Subtracting the family contribution calculated by this program from the cost of education at a particular college will indicate the student's "need" at that college. Most grants, National Direct Student Loans (loans made directly by the college) and jobs in the Federal College Work-Study Program are limited by the amount of need.

A student's financial aid cannot exceed this demonstrated need. There is no guarantee that a college will always be able to meet 100% of this need, but students who do demonstrate need are likely to get at least some help.

Knowing the amount of need is also useful for another purpose. In the past, all students could get federally subsidized Guaranteed Student Loans (the student loans obtained from banks) regardless of need. At the present time, however, students whose families have incomes of $30,000 or more can get these loans only if they have demonstrated need.

There have been proposals to limit loans to the amount of demonstrated need no matter what family income is, and this may well be in effect by September, 1982. Knowing one's "need" is, therefore, an important piece of information for anyone who may be interested in a Guaranteed Student Loan next year.

This program, by the way, will not tell a student anything about eligibility for Pell Grants, the federal program which makes awards directly to students. Eligibility for Pell Grants is determined by a different formula established by the Department of Education. At press time, the formula for the 1982-83 school year had not been determined.

Program Notes

The structure of this Applesoft Basic program is contained in the control section. Program flow consists of successive calls to major subroutines. Table 1 outlines the function of each routine. The calculation of family contribution requires reference to several tables. They are included here as DOS textfiles (Table 2) but they could just as well be DATA within the program.

Looking over the program (Listing 1) one will notice that text and slots in the input matrix are provided for questions not used by the program. I have done this to allow for easy expansion of the program to determine Pell Grant eligibility, once that formula is published by the U.S. Department of Education.

After entering the program and getting it to run, it is important to make sure that all numerical data and calculations are correct. In addition to careful proofreading, I have provided three sample dependent student cases (Table 3) and two sample independent student cases (Table 4) to test against. □

John B. Fisher, Director of Financial Aid, Bloomfield College, Bloomfield, NJ 07003.

Lines	Function
10 — 500	Program Set-Up
4000 — 4999	Strings for input questions
5000 — 5999	Control Section
6000 — 6999	Set-up for new student
7000 — 19999	Input
20000 — 24999	Calculation for dependent student
25000 — 29999	Calculation for independent student
30000 — 39999	Report
40000 — 49999	Miscellaneous Subroutines
50000	END

Table 1.

Table 3.

Input	Case 1	Case 2	Case 3
State	NJ	CA	MS
Parent Age	50	60	48
Marital Status	M	S	M
College Year	1	3	1
Family Size	4	3	5
Number in College	1	2	3
Adjusted Gross	$20,000	$15,000	$30,000
US Tax	2,000	1,200	4,500
Father's Income	12,000	0	30,000
Mother's Income	8,000	12,000	0
Social Security	0	4,000	0
AFDC	0	0	0
Other Income	0	0	0
Medical/Dental	500	1,000	800
Student Assets	300	0	0
Cash and Savings	2,000	200	1,000
Home Value	50,000	0	70,000
Mortgage	35,000	0	40,000
Investments	0	10,000	0
Debt on Investment	0	0	0
Business Value	0	0	100,000
Business Debt	0	0	60,000
Social Security/Month	0	100	0
Number of Months	0	9	0
V.A. Benefits	0	0	40
Number of Months	0	0	12
Other Income	0	0	500
Results			
Parent Contribution			
From Income	514	570	983
From Assets	-168	-90	4
Total Parent Contribution	347	480	988
Student Contribution			
Summer Savings	700	900	700
Social Security	0	900	0
V.A. Benefits	0	0	480
Other Benefits	0	0	500
From Assets	104	0	0
Total Student Contribution	804	1,800	1,680
Total Family Contribution	$1,151	$2,280	$2,268

Table 2.

```
A(57,2)
9          5
7          3
8          4
4          0
8          2
12         4
10         3
9          2
4          0
11         6
10         7
6          0
8          3
4          0
10         5
9          4
9          4
8          2
7          2
9          4
8          2
5          1
13         5
12         6
10         3
10         4
12         7
8          3
7          2
8          4
9          4
8          3
9          3
8          1
10         3
8          3
15         7
6          0
7          3
7          3
10         6
9          3
4          0
11         3
8          4
7          0
5          0
4          0
5          0
9          3
9          4
4          0
11         5
7          0
13         6
6          3
5          0
```

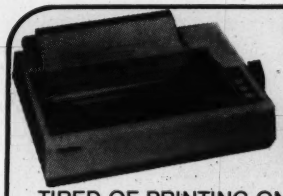
```
B(5,4)
6970       5780       0          0
8690       7500       6310       0
10730      9540       8350       7160
12660      11470      10280      9090
14810      13620      12430      11240

C(26,2)
24600      19800
25300      20200
26000      20700
26700      21200
27400      21600
28100      22200
28900      22700
29700      23300
30700      23900
31500      24500
32600      25100
33500      25700
34700      26600
35800      27200
37000      28100
38300      28800
39600      29700
41200      30400
42500      31300
44200      32200
45600      33300
47400      34300
49200      35300
51100      36400
53400      37700
55400      38800

D(15,2)
1600       1300
3300       2600
4900       4000
6600       5300
8200       6600
9800       7900
11500      9200
13100      10600
14800      11900
16400      13200
18000      14500
19700      15800
21300      17200
23000      18500
24600      19800

E(6,2)
5120       5260
6870       9500
9060       11840
10820      14620
13740      17250
16230      20180

F(30,2)
2100       294.16
4200       630.18
8500       1404.21
12600      2265.24
16800      3273.28
21200      4505.32
26500      6201.37
31800      8162.43
42400      12720.49
56600      19678.54
2100       294.16
4200       730.18
6400       1026.22
9500       1708.24
12700      2476.26
15900      3308.31
21200      4951.36
26500      6859.42
31800      9085.46
42400      13961.54
1100       154.16
2100       314.18
4200       892.19
6200       1072.21
8500       1555.24
10600      2059.26
12700      2605.3
15900      3565.34
21200      5367.39
26500      7434.44
```



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	LA34 DECwriter IV Forms Ctrl.	1,095	105	58	40
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	LA120 DECwriter III RO	2,095	200	112	75
	VT100 CRT DEScope	1,695	162	90	61
	VT101 CRT DEScope	1,195	115	67	43
	VT125 CRT Graphics	3,295	315	185	119
	VT131 CRT DEScope	1,745	167	98	63
	VT132 CRT DEScope	1,995	190	106	72
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TEXAS INSTRUMENTS	TI745 Portable Terminal	1,595	153	85	58
	TI765 Bubble Memory Terminal	2,595	249	138	93
	TI Insight 10 Terminal	695	67	37	25
	TI785 Portable KSR, 120 CPS	2,395	230	128	86
	TI787 Portable KSR, 120 CPS	2,845	273	152	102
	TI810 RO Printer	1,695	162	90	61
	TI820 KSR Printer	2,195	211	117	80
LEAR SIEGLER	ADM3A CRT Terminal	595	57	34	22
	ADM5 CRT Terminal	645	62	36	24
	ADM32 CRT Terminal	1,155	112	65	42
	ADM42 CRT Terminal	1,995	190	106	72
DATAMEDIA	EXCEL 12 CRT Terminal	1,695	162	90	61
	EXCEL 42 Smart Buffered CRT	995	96	54	36
	COLORSCAN 10 Color CRT	3,195	307	171	116
TELEVIDEO	925 CRT Terminal	850	82	46	31
	950 CRT Terminal	1,075	103	57	39
NEC SPINWRITER	Letter Quality, 7715 RO	2,895	278	154	104
	Letter Quality, 7725 KSR	3,295	316	175	119
GENERAL ELECTRIC	2030 KSR Printer 30 CPS	1,195	115	67	43
	2120 KSR Printer 120 CPS	2,195	211	117	80
HAZELTINE	Executive 80/20	1,345	127	75	49
	Executive 80/30	1,695	162	90	61
EPSON	MX-80 F/T Printer	745	71	42	27
	MX-100 Printer	895	86	48	32
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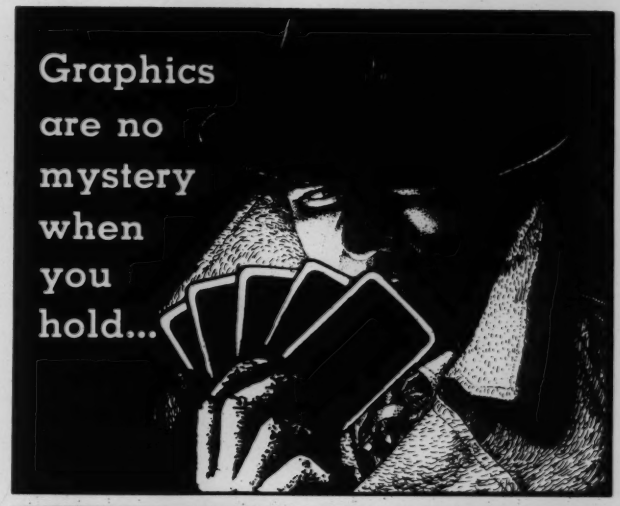
CIRCLE 181 ON READER SERVICE CARD



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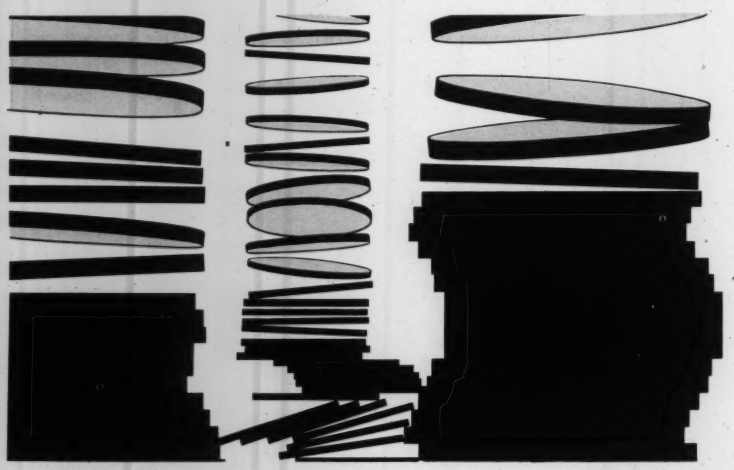
CIRCLE 122 ON READER SERVICE CARD

Table 4.

Input	Case 1	Case 2
State	ME	WA
Student Age	25	35
Marital Status	S	S
Family Size	1	2
College Year	1	1
Cash and Savings	$2,000	$5,000
Home Value	0	45,000
Mortgage	0	30,000
Investment	0	0
Debt on Investment	0	0
Business Value	0	0
Business Debt	0	0
Summer Earnings	3,000	3,000
1982-83 Earnings	5,000	9,000
Social Security/Month	200	0
Number of Months	12	0
V.A. Benefits	0	150
Number of Months	0	9
Other Income	0	0
Results		
Parent Contribution		
From Income	0	0
From Assets	0	0
Total Parent Contribution	0	0
Student Contribution		
From Earnings	8,769	11,293
Social Security	2,406	0
V.A. Benefits	0	1,350
Other Benefits	0	0
From Assets	2,000	3,606
Total Student Contribution	13,169	16,243
Total Family Contribution	$13,169	$16,243



Listing 1.

```
10  REM  STUDENT FINANCIAL AID
20  REM  NEED CALCULATION
30  REM  J. FISHER, DECEMBER 1981
100  REM  PROGRAM SET UP
110  DIM I(38),A(57,2),B(5,4)
120 S$ = "AKALARASAZCACOCTCHDCDEFLGAGUHIIAI
    DILINKYKSLAMAMDMEMIMNMOMSMTNCND NENHNJNM
    NYNVOHOKORPAPRRISCSDTNTTTXUTVAVIVTWAWIW
    VWY"
130  DIM C(26,2),D(15,2),E(6,2)
140  DIM F(36,2)
150 D$ =  CHR$ (4)
160  PRINT D$;"OPEN TABLES"
170  PRINT D$;"READ TABLES"
180  FOR N = 1 TO 57
190  INPUT X,Y
200 A(N,1) = X:A(N,2) = Y
210  NEXT N
220  FOR N = 1 TO 5
230  INPUT W,X,Y,Z
240 B(N,1) = W:B(N,2) = X
250 B(N,3) = Y:B(N,4) = Z
260  NEXT N
270  FOR N = 1 TO 26
280  INPUT X,Y
290 C(N,1) = X:C(N,2) = Y
300  NEXT N
310  FOR N = 1 TO 15
320  INPUT X,Y
330 D(N,1) = X:D(N,2) = Y
340  NEXT N
350  FOR N = 1 TO 6
360  INPUT X,Y
370 E(N,1) = X:E(N,2) = Y
380  NEXT N
390  FOR N = 1 TO 30
400  INPUT X,Y
410 F(N,1) = X:F(N,2) = Y
420  NEXT N
500  PRINT D$;"CLOSE TABLES"
4000  REM  STRING DATA FOR INPUT
4001  DATA  "DEPENDENCY STATUS (D/I)"
4002  DATA  "STATE ABREVIATION"
4003  DATA  "AGE OF OLDER PARENT"
4004  DATA  "AGE OF STUDENT"
4005  DATA  "PARENT MARITAL STATUS"
4006  DATA  "STUDENT MARITAL STATUS"
4007  DATA  "YEAR IN COLLEGE"
4008  DATA  "SIZE OF HOUSEHOLD"
4009  DATA  "NUMBER IN COLLEGE"
4010  DATA  "ADJUSTED GROSS INCOME"
4011  DATA  "U.S. INCOME TAX"
4012  DATA  "STATE AND LOCAL INCOME TAX"
4013  DATA  "INCOME FROM WORK"
4014  DATA  "INCOME FROM WORK"
4015  DATA  "FAMILY SOCIAL SECURITY"
4016  DATA  "AFDC (WELFARE)"
4017  DATA  "OTHER NON-TAXABLE INCOME"
4018  DATA  "MEDICAL/DENTAL EXPENSES"
4019  DATA  "PRE-COLLEGE TUITION"
4020  DATA  "STUDENT & SPOUSE 81 INCOME"
4021  DATA  "STUDENT & SPOUSE NET ASSETS"
4022  DATA  "CASH AND SAVINGS"
4023  DATA  "HOME MARKET VALUE"
4024  DATA  "OUTSTANDING MORTGAGE"
4025  DATA  "OTHER INVESTMENTS"
4026  DATA  "DEBTS ON OTHER INVESTMENTS"
4027  DATA  "BUSINESS/FARM VALUE"
4028  DATA  "DEBTS ON BUSINESS/FARM"
4029  DATA  "STUDENT SUMMER '82 INCOME"
4030  DATA  "STUDENT 82-83 INCOME"
4031  DATA  "SPOUSE SUMMER '82 INCOME"
4032  DATA  "SPOUSE 82-83 INCOME"
4033  DATA  "SOCIAL SECURITY PER MONTH"
4034  DATA  "SOCIAL SEC: NO. OF MONTHS"
4035  DATA  "V.A. BENEFITS PER MONTH"
4036  DATA  "VA BENEFITS: NO. OF MONTHS"
4037  DATA  "OTHER NON-TAXABLE INCOME"
5000  REM  CONTROL SECTION
```

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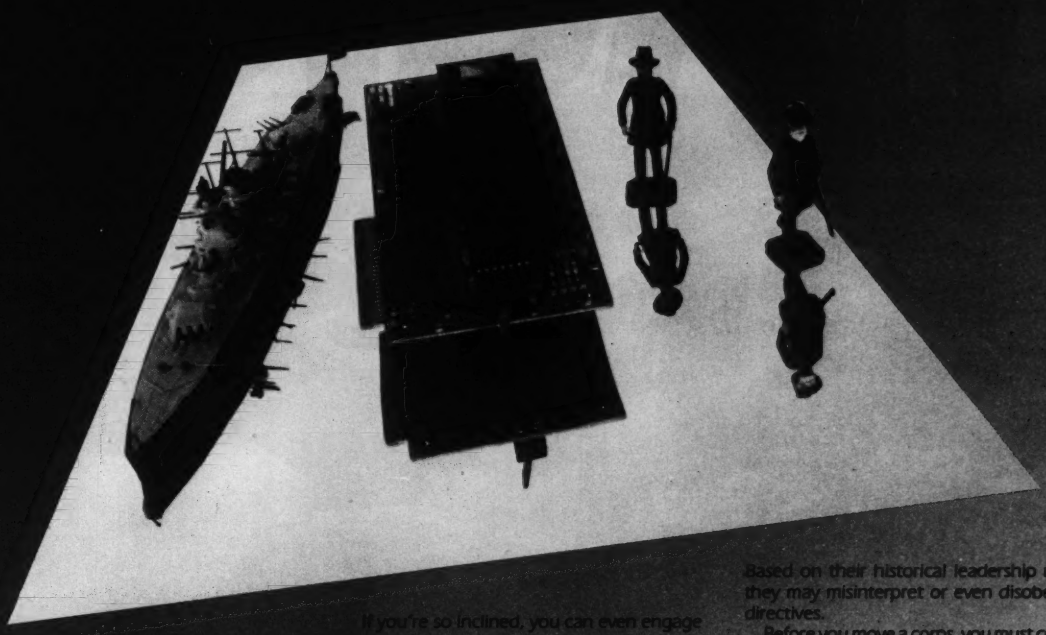

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CIRCLE 254 ON READER SERVICE CARD

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CIRCLE 103 ON READER SERVICE CARD

Aid, continued...

```
5100  GOSUB 6000
5200  GOSUB 7000
5210  IF I(1) = 1 THEN  GOSUB 20000
5215  IF I(1) = 0 THEN  GOSUB 25000
5220  GOSUB 30000
5700  HOME
5705  VTAB 3
5710  PRINT "TO DETERMINE YOUR 'NEED', SUBTRACT"
5715  PRINT
5720  PRINT "THIS TOTAL FAMILY CONTRIBUTION OF"
5725  PRINT
5730  PRINT H;" FROM THE COST OF EDUCATION AT A"
5735  PRINT
5740  PRINT "PARTICULAR SCHOOL."
5750  PRINT
5760  IF H >  = 0 THEN 5800
5770  PRINT "CONTRIBUTIONS LESS THAN 0 ARE": PRINT
5780  PRINT "SOMETIMES USED FOR RANKING PURPOSES": PRINT
5790  PRINT "BUT 'NEED' IS NEVER GREATER THAN": PRINT
5795  PRINT "THE COST OF EDUCATI0N": PRINT
5800  PRINT : PRINT "PRESS 'N' FOR A NEW STUDENT": PRINT
5810  INPUT "OR ANY OTHER KEY TO END";Z$
5820  IF Z$ = "N" THEN 5000
5999  END
6000  REM  SET UP FOR NEW STUDENT
6010 A$ = ""
6030  FOR N = 1 TO 38
6040 I(N) = 1
6050  NEXT N
6060  RESTORE
6070 C7 = 0
6080 T1 = 3:T2 = 35:T3 = 38
6999  RETURN
7000  REM  INPUT
7100  HOME
7102  PRINT
7104  PRINT
7110  PRINT "   THIS PROGRAM WILL HELP YOU FIND OUT"
7120  PRINT "YOUR ELIGIBILITY FOR STUDENT FINANCIAL"
7130  PRINT "AID AS A COLLEGE STUDENT DURING THE"
7140  PRINT "1982-83 ACADEMIC YEAR"
7150  PRINT
7160  PRINT "   STUDENT AID IS LIMITED TO YOUR"
7170  PRINT "'NEED'.  THE DEFINITION OF 'NEED' IS"
7180  PRINT "THE COST OF EDUCATION MINUS THE AMOUNT"
7190  PRINT "YOUR FAMILY IS EXPECTED TO CONTRIBUTE"
7200  PRINT
7210  PRINT "   THIS PROGRAM WILL HELP YOU ESTIMATE"
7220  PRINT "YOUR EXPECTED FAMILY CONTRIBUTION."
7230  PRINT "THE COST OF EDUCATION DIFFERS WIDELY"
7240  PRINT "AND YOU WILL HAVE TO GET PARTICULAR"
7250  PRINT "AMOUNTS FROM INDIVIDUAL COLLEGES."
7260  PRINT "SUBTRACTING THE CONTRIBUTION ESTIMATED"
7270  PRINT "BY THIS PROGRAM WILL SHOW YOUR 'NEED'."
7280  PRINT
7290  INPUT "PRESS (RETURN) TO CONTINUE ";Z$
7292  HOME
7300  PRINT "   FIRST IT IS NECESSARY TO DETERMINE"
7310  PRINT "IF YOU WILL BE CONSIDERED DEPENDENT"
7320  PRINT "OR SELF-SUPPORTING.  THREE QUESTIONS"
7330  PRINT "MUST BE CONSIDERED:"
7340  PRINT
7350  PRINT "1. DID (WILL) YOU LIVE WITH YOUR"
7360  PRINT "   YOUR PARENTS IN 1981 OR 1982?"
7370  PRINT "2. DID (WILL) THEY CLAIM YOU AS A"
7380  PRINT "   TAX EXEMPTION EITHER YEAR?"
7390  PRINT "3. DID (WILL) THEY GIVE YOU MORE THAN"
7400  PRINT "   $750 OF SUPPORT EITHER YEAR?"
7410  PRINT
7420  PRINT "   IF THE ANSWER TO ANY PART OF THESE"
7430  PRINT "THREE QUESTIONS IS 'YES' THEN YOU ARE"
7440  PRINT "CONSIDERED 'DEPENDENT'.  IF THE ANSWER"
7450  PRINT "TO ALL PARTS IS 'NO' THEN YOU ARE"
7460  PRINT "CONSIDERED 'SELF-SUPPORTING."
7470  PRINT
7480  PRINT "   BASED ON THIS DESCRIPTION, ANSWER"
7490  PRINT "'D' OR 'I' BELOW:"
7510  GOSUB 40045
7512  GOTO 7550
7530  GOSUB 40060
7550  IF I$ = "I" THEN I(1) = 0
7552  IF I$ = "I" THEN  GOSUB 40300
7554  IF I$ = "D" THEN  GOSUB 40850
7560  IF I$ = "D" OR I$ = "I" THEN 7600
7570  GOSUB 40030
7580  PRINT "PLEASE ANSWER 'D' OR 'I'"
7590  GOTO 7530
7600  GOSUB 40400
7620  GOSUB 40045
7625  REM
7630  GOSUB 40600
7640  IF I$ = G$ THEN 8500
7650  GOSUB 40030: INVERSE : PRINT I$;
7660  NORMAL : PRINT " IS NOT LISTED. TRY AGAIN    "
7670  GOSUB 40060
7680  GOTO 7625
8500  IF I(3) = 0 THEN  READ 0$
8501  IF I(3) = 0 THEN 9000
8502  GOSUB 40040
8505 N = 3
8510  GOSUB 40200
9000  IF I(4) = 0 THEN  READ 0$
9001  IF I(4) = 0 THEN 9500
9002  GOSUB 40040
9005 N = 4
9010  GOSUB 40200
9500  IF I(5) = 0 THEN  READ 0$
9502  IF I(5) = 0 THEN 10000
9505  HOME
9510  GOSUB 40700
9520  GOSUB 40045
9540  IF I$ = "S" THEN I(5) = 0
9550  IF I$ = "H" OR I$ = "S" THEN 10000
9560  GOSUR 40030
9570  PRINT "PLEASE ANSWER 'H' OR 'S'"
9580  GOSUB 40060
9590  GOTO 9540
10000  IF I(6) = 0 THEN  READ 0$
10002  IF I(6) = 0 THEN 11000
10005  HOME
10010  GOSUB 40700
10020  GOSUB 40045
10030  IF I$ = "S" THEN I(6) = 0
10032  IF I(6) = 0 THEN I(31) = 0
10034  IF I(6) = 0 THEN I(32) = 0
10036  IF I(6) = 0 AND I(1) = 0 THEN I(14) = 0
10040  IF I$ = "S" OR I$ = "H" THEN 11000
10050  GOSUB 40030
10060  PRINT "PLEASE ANSWER 'H' OR 'S'"
10070  GOSUB 40060
10080  GOTO 10030
11000  FOR N = 7 TO 37
11002  HOME
11005  IF I(N) = 0 THEN  READ 0$
11007  IF I(N) = 0 THEN 16000
11010  GOSUB 40100
11020  IF N = 7 THEN  GOSUB 41000
11030  IF N = 8 THEN  GOSUB 41100
11040  IF N = 10 THEN  GOSUB 41200
11050  IF N = 11 THEN  GOSUB 41300
11060  IF N = 15 THEN  GOSUB 41400
11070  IF N = 22 THEN  GOSUB 41500
11080  IF N = 33 THEN  GOSUB 41600
11090  IF N = 9 THEN  GOSUB 41800
11100  IF N = 29 OR N = 31 THEN  GOSUB 41900
11110  IF N = 30 OR N = 32 THEN  GOSUB 41950
11120  IF N = 13 THEN  GOSUB 42000
11130  IF N = 14 THEN  GOSUB 42000
14000  GOSUB 40045
14100  GOSUB 40200
14200  IF I(23) = 0 THEN I(24) = 0
14210  IF I(25) = 0 THEN I(26) = 0
14220  IF I(27) = 0 THEN I(28) = 0
14230  IF I(33) = 0 THEN I(34) = 0
14240  IF I(35) = 0 THEN I(36) = 0
16000  NEXT N
16005  HOME
16010  VTAB 11: HTAB 12
16020  FLASH : PRINT "CALCULATING"
16100  FOR N = 1 TO 38
16110  IF I(N) < 0 THEN I(N) = 0
16120 I(N) =  INT (I(N))
16130  NEXT N
16140  IF I(8) < 1 THEN I(8) = 1
19999  RETURN
20000  REM  DEPENDENT PC
20010 A1 = I(10) + I(15) + I(16) + I(17)
20020 A2 = I(13) * .0685
20030  IF A2 > 1975 THEN A2 = 1975
20040 A3 = I(14) * .0685
20050  IF A3 > 1975 THEN A3 = 1975
20060 A3 = A3 + A2
20065  IF I(1) = 0 THEN  RETURN
20070 A4 = A(I(2),1)
20080  IF A1 >  = 15000 THEN A4 = A4 - 1
20090 A4 = (A4 * .01) * A1
20100 A5 = I(18) - (A1 * .03)
20110  IF A5 < 0 THEN A5 = 0
20120  IF I(13) > I(14) THEN A6 = I(13)
20130  IF I(14) > I(13) THEN A6 = I(14)
20135 A6 = A6 * .3
20140  IF A6 > 1800 THEN A6 = 1800
```

Aid, continued...

```
20150  IF I(5) = 0 THEN 20190
20160  IF I(13) < I(14) THEN A6 = I(13)
20170  IF I(14) < I(13) THEN A6 = I(14)
20175 A6 = A6 * .3
20180  IF A6 > 1800 THEN A6 = 1800
20190 A7 = I(8):A8 = I(9)
20200  IF A7 > 6 THEN A7 = 6
20210  IF A7 < 2 THEN A7 = 2
20220  IF A8 < 1 THEN A8 = 1
20230  IF A8 > 4 THEN A8 = 4
20240 A9 = B((A7 - 1),A8)
20242  IF I(8) > A7 THEN A9 = A9 + ((I(8) - A7) * 1670)
20250 B1 = I(11) + A3 + A4 + A5 + A6 + A9
20260 B2 = A1 - B1
20265 B5 = I(27) - I(28)
20270 B4 = 130000 + (B5 - 250000)
20275  IF B5 < 250000 THEN B4 = 70000 + ((B5 - 150000) * .6)
20280  IF B5 < 150001 THEN B4 = 20000 + ((B5 - 50000) * .5)
20290  IF B5 < 50001 THEN B4 = B5 * .5
20300  IF B5 < 1 THEN B4 = 0
20310 B6 = I(22) + I(23) - I(24) + I(25) - I(26) + B4
20315 B7 = I(3)
20320  IF I(3) < 40 THEN B7 = 40
20330  IF I(3) > 65 THEN B7 = 65
20340 B8 = D(B7 - 39,2 - I(5))
20350 B9 = B6 - B8
20360 C1 = 0
20370  IF B2 < 12500 THEN C1 = ((12500 - B2) / 12500) * .06
20380  IF B2 <  = 0 THEN C1 = .06
20390  IF B9 > 0 THEN C1 = .12
20400 C2 = B9 * C1
20410 C3 = B2 + C2
20420 C4 = 3412 + ((C3 - 12600) * .47)
20430  IF C3 < 12601 THEN C4 = 2772 + ((C3 - 11000) * .4)
20440  IF C3 < 11001 THEN C4 = 2228 + ((C3 - 9400) * .34)
20450  IF C3 < 9401 THEN C4 = 1364 + ((C3 - 6200) * .25)
20470  IF C3 < 6201 THEN C4 = C3 * .22
20480  IF C3 <  = 3409 THEN C4 =  - 750
20485  IF C7 = 1 THEN  RETURN
20490 C5 = (1 / A8) * C4
20500 C3 = B2:C7 = 1
20510  GOSUB 20420
20520 C8 = (1 / A8) * C4
20530 C9 = C5 - C8
20540 D1 = 700
20550  IF I(7) > 1 THEN D1 = 900
24999  RETURN
25000  REM  IND CALC
25010 A1 = I(29) + I(30) + I(31) + I(32) + (I(33) * I(34))
      + (I(35) * I(36)) + I(37)
25020 F1 = 2300: IF I(6) = 1 THEN F1 = 3400
25030 F2 = (I(29) + I(30) + I(31) + I(32)) - (F1 +
      (I(8) * 1000))
25040  IF F2 < 0 THEN F2 = 0
25050 I(11) = F2 * .14:F3 = 1
25060  IF I(6) = 0 AND I(8) = 1 THEN F3 = 11
25070  IF I(6) = 0 AND I(8) <  = 1 THEN F3 = 21
25080  FOR N = F3 TO F3 + 9
25090  IF F2 > F(N,1) THEN I(11) =  INT (F(N,2)) + ((F2 -
      F(N,1)) * (F(N,2 ) -  INT (F(N,2))))
25100  NEXT N
25110 I(11) =  INT (I(11))
25120 I(13) = I(29) + I(30):I(14) = I(31) + I(32)
25130  GOSUB 20020
25140 A4 = A(I(2),2)
25150 A4 = (A4 * .01) * A1
25160 B1 = A4 + A3 + I(11):C8 = A1 - B1
25170 B6 = I(22) + I(23) - I(24) + I(25) - I(26)
      + I(27) - I(28)
25175 F4 = I(4)
25180  IF I(4) < 26 THEN F4 = 26
25190  IF I(4) > 40 THEN F4 = 40
25200 B8 = D(F4 - 25,1)
25210  IF I(8) < 2 THEN B8 = D(F4 - 25,2)
25215  IF I(4) < 26 THEN B8 = 0
25220 I(21) = B6 - B8
25225  IF I(21) < 0 THEN I(21) = 0
25900  RETURN
30000  REM  REPORT
30010  HOME
30012  NORMAL
30015  PRINT
30020  PRINT "PARENT CONTRIBUTION:"
30050  PRINT
30060  HTAB T1: PRINT "FROM INCOME";
30070 H =  INT (C8): IF I(1) = 0 THEN H = 0: GOSUB 40900
30080  HTAB T2: PRINT H
30090  PRINT
30100  HTAB T1: PRINT "FROM ASSETS";
30110 H =  INT (C9): IF I(1) = 0 THEN H = 0: GOSUB 40900
30120  HTAB T2: PRINT H
30130  PRINT
30135  HTAB T1
30140  PRINT "TOTAL PARENT CONTRIBUTION";
30150 H =  INT (C5): IF I(1) = 0 THEN H = 0: GOSUB 40950
30160  INVERSE : HTAB T3: PRINT H: NORMAL
30170  PRINT
30180  PRINT "STUDENT CONTRIBUTION:"
30190  PRINT
30195  IF I(1) = 0 THEN  GOSUB 41700
30196  IF I(1) = 0 THEN 30210
30200  HTAB T1: PRINT "SUMMER SAVINGS";
30210 H =  INT (D1): GOSUB 40900
30220  HTAB T2: PRINT H
30225 D2 = H
30230  PRINT
30232  HTAB T1: PRINT "SOCIAL SECURITY";
30234 H =  INT (I(33) * I(34)): GOSUB 40900
30236  HTAB T2: PRINT H:D2 = D2 + H
30238  PRINT
30240  HTAB T1: PRINT "VA BENEFITS";
30250 H =  INT (I(35) * I(36)): GOSUB 40900
30260  HTAB T2: PRINT H
30265 D2 = D2 + H
30268  PRINT
30270  HTAB T1: PRINT "OTHER BENEFITS";
30280 H =  INT (I(37)): GOSUB 40900
30290  HTAB T2: PRINT H
30295 D2 = D2 + H
30298  PRINT
30300  HTAB T1: PRINT "FROM ASSETS";
30302 H =  INT (I(21) * .35): IF I(1) = 0 THEN H =
      I(21): GOSUB 40900
30304  HTAB T2: PRINT H:D2 = D2 + H
30306  PRINT : HTAB T1: PRINT "TOTAL STUDENT CONTRIBUTION";
30310 H = D2: GOSUB 40950
30320  INVERSE : HTAB T3: PRINT H: NORMAL
30330  PRINT
30340  PRINT "TOTAL FAMILY CONTRIBUTION";
30350 H =  INT (C5 + D2): GOSUB 40950
30360  INVERSE : HTAB T3: PRINT H;: NORMAL
34960  GET A$
```


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CIRCLE 251 ON READER SERVICE CARD

Aid, continued...

```
34999  RETURN
35000  REM  IND REPORT
35010  PRINT INDREP OR T
35020  RETURN
40000  REM  SUBROUTINES
40010  VTAB 22: HTAB 1
40015  RETURN
40020  VTAB 22: HTAB 30
40025  RETURN
40030  VTAB 23: HTAB 1
40035  RETURN
40040  HOME
40045  READ Q$:Q$ = A$ + Q$
40050  GOSUB 40010: PRINT Q$
40060  GOSUB 40020: PRINT "       "
40070  GOSUB 40020
40080  INPUT "";I$
40090  RETURN
40100 A$ = ""
40110  IF I(1) = 0 AND N = 13 THEN A$ = "STUDENT'S "
40120  IF I(1) = 0 AND N = 14 THEN A$ = "SPOUSE'S "
40130  IF I(1) = 1 AND N = 13 THEN A$ = "FATHER'S "
40140  IF I(1) = 1 AND N = 14 THEN A$ = "MOTHER'S "
40150  RETURN
40200  IF  LEN (I$) = 0 THEN I(N) = 0
40210  IF  LEN (I$) = 0 THEN 40350
40220 H$ = ""
40225 G$ = ""
40226 H$ = ""
40230  FOR M = 1 TO  LEN (I$)
40240 G$ =  MID$ (I$,M,1)
40250 Z9 =  ASC (G$)
40260  IF  NOT ((Z9 > 47 AND Z9 < 58) OR Z9 = 46) THEN 40280
40270 H$ = H$ + G$
40280  NEXT M
40310 I$ = ""
40320 I$ = H$
40340 I(N) =  VAL (I$)
40350  RETURN
40400  HOME
40410  VTAB 5
40420  PRINT "PROVIDE THE TWO LETTER ABBREVIATION"
40430  PRINT "FOR THE STATE IN WHICH YOU LIVE."
40440  PRINT
40450  PRINT "OFFICIAL ABBREVIATIONS ARE AS FOLLOWS:"
40460  PRINT
40470  FOR N = 1 TO 113 STEP 2
40480  PRINT  MID$ (S$,N,2);
40490  PRINT " ";
40500  IF N = 21 OR N = 43 OR N = 65 OR N = 87
       OR N = 109 THEN  PRINT " "
40510  NEXT N
40520  RETURN
40600  IF  LEN (I$) = 0 THEN I$ = "RETURN"
40602 P = 1
40605  FOR N = 1 TO 113 STEP 2
40610 G$ =  MID$ (S$,N,2)
40615  IF I$ = G$ THEN I(2) = P
40620  IF I$ = G$ THEN 40650
40630 G$ = ""
40632 P = P + 1
40640  NEXT N
40650  RETURN
40700  VTAB 8
40710  PRINT "PLEASE ANSWER 'M' FOR MARRIED"
40715  PRINT
40720  PRINT "OR 'S' FOR SINGLE (INCLUDING"
40730  PRINT : PRINT "SEPARATED, DIVORCED, OR WIDOWED."
40740  RETURN
40800 I(3) = 0:I(5) = 0:I(7) = 0
40810 I(12) = 0:I(20) = 0:I(21) = 0
40815 I(19) = 0:I(10) = 0:I(11) = 0:I(12) = 0
40816 I(13) = 0:I(14) = 0:I(15) = 0:I(16) = 0
40817 I(17) = 0:I(18) = 0:I(19) = 0
40820  RETURN
40850 I(4) = 0:I(12) = 0
40855 I(19) = 0:I(29) = 0:I(30) = 0
40856 I(31) = 0:I(32) = 0
40857 I(20) = 0:I(6) = 0
40860  RETURN
40900 T2 = 35:H1 = 0: FOR N = 1 TO 8
40910 H1 = ((H1 + 1) * 10) - 1
40920  IF  ABS (H) > H1 THEN T2 = T2 - 1
40930  NEXT N
40935  IF H < 0 THEN T2 = T2 - 1
40940  RETURN
40950 T3 = 38:H1 = 0: FOR N = 1 TO 8
40960 H1 = ((H1 + 1) * 10) - 1
40970  IF  ABS (H) > H1 THEN T3 = T3 - 1
40980  NEXT N
40985  IF H < 0 THEN T3 = T3 - 1
40990  RETURN
41000  HOME : VTAB 5
41010  PRINT "WHICH YEAR IN SCHOOL WILL 82-83 BE?"
41020  PRINT
41030  PRINT "FRESHMAN = 1"
41040  PRINT "SOPHOMORE = 2"
41050  PRINT "JUNIOR = 3"
41060  PRINT "SENIOR OR FIFTH YEAR = 4"
41070  PRINT
41080  PRINT "ENTER NUMBER (1-4) BELOW:"
41090  RETURN
41100  VTAB 5
41110  PRINT "INCLUDE IN THE NUMBER BELOW, THE"
41120  PRINT
41130  PRINT "PARENTS AND ALL DEPENDENTS IN THE"
41140  PRINT
41150  PRINT "FAMILY, INCLUDING THE STUDENT."
41160  RETURN
41200  VTAB 5
41210  PRINT "THE AMOUNT BELOW SHOULD BE TAKEN"
41220  PRINT
41230  PRINT "FROM THE PARENTS IRS FORM 1040 LINE 31"
41240  PRINT
41250  PRINT "OR IRS FORM 1040A LINE 10"
41255  PRINT : PRINT
41260  PRINT "ALL OF THE FOLLOWING INCOME AND"
41265  PRINT
41270  PRINT "EXPENSE QUESTIONS REFER TO THE YEAR"
41275  PRINT
41280  PRINT "1981 UNLESS OTHERWIESE NOTED"
41290  RETURN
41300  VTAB 5
41310  PRINT "THE ANSWER BELOW SHOULD BE FROM"
41320  PRINT
41330  PRINT "THE PARENTS IRS FORM 1040 LINE 47"
41340  PRINT
41350  PRINT "OR IRS FORM 1040A LINE 15A"
41360  RETURN
41400  VTAB 5
41410  PRINT "INCLUDE BELOW SOCIAL SECURITY"
41420  PRINT
41430  PRINT "BENEFITS RECEIVED BY ALL MEMBERS OF"
41440  PRINT
41450  PRINT "FAMILY EXCEPT STUDENT"
41460  RETURN
41500  VTAB 5
41510  PRINT "THE FOLLOWING QUESTIONS ON ASSETS"
41520  PRINT
41530  PRINT "REFER TO ASSETS HELD BY THE "
41535  PRINT
41540  IF I(1) = 1 THEN  PRINT "STUDENT'S PARENTS"
41550  IF I(1) = 0 THEN  PRINT "STUDENT (AND SPOUSE)"
41560  RETURN
41600  VTAB 5
41610  PRINT "THE FOLLOWING QUESTIONS ON SOCIAL"
41620  PRINT
41630  PRINT "SECURITY, VA BENEFITS AND OTHER"
41640  PRINT
41650  PRINT "NON-TAXABLE INCOME REFERS TO"
41660  PRINT
41670  PRINT "BENEFITS RECEIVED BY THE STUDENT"
41680  PRINT
41690  PRINT "DURING THE PERIOD 7/1/82 TO 6/30/83"
41695  RETURN
41700  HTAB T1: PRINT "FROM EARNINGS";
41710 D1 = C8: RETURN
41800  VTAB 5
41810  PRINT "OF THE ";I(8);" PEOPLE IN THE"
41815  PRINT
41820  PRINT "THE HOUSEHOLD, HOW MANY WILL"
41825  PRINT
41830  PRINT "ATTEND COLLEGE IN 82-83"
41840  RETURN
41900  VTAB 5
41910  PRINT "SUMMER '82 REFERS TO JUNE,JULY"
41920  PRINT : PRINT "AND AUGUST OF 1981"
41930  RETURN
41950  VTAB 5
41960  PRINT "82-83 REFERS TO THE NINE MONTH PERIOD"
41970  PRINT : PRINT "FROM SEPTEMBER THROUGH JUNE OF 82-83"
41980  RETURN
42000  VTAB 5
42010  PRINT "ENTER BELOW THE PART OF FAMILY INCOME"
42020  PRINT : PRINT "WHICH COMES FROM THE ";A$"
42030  PRINT : PRINT "INCOME FROM WORK"
42040  RETURN
50000  END
```

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David M. Conley

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All addresses and data are in hex, not in decimal, so no conversion is required. Using hex also saves memory. A 32K PET will hold approximately 8.6K of machine language in Basic form, with the program in the form shown here. However, it can be shortened by leaving out the REMs, blank lines, spaces, etc.

The "fixes" for the various ROMs are given in the listing.

This program will check for bad input addresses (for example, it won't go from $A100 to $A000, or start at A0000), and when POKEing a program into memory, it will only put it into RAM.

The old PETs had their ROM code protected, which meant that you couldn't PEEK into it. This program uses a short machine language program that can look into that forbidden area, although why you would want to do that is a mystery to me. For the new PETs, you don't need this subroutine.

The heart of this program is the series of POKEs in lines 340 and 350. The first POKE tells the PET that there are three keystrokes in the keyboard buffer. The second is a "Cursor Home" command. The third and fourth POKEs are carriage returns.

This routine can be used for many other kinds of self-modifying programs. The buffer can store a total of ten keystrokes.

As the program runs, it becomes obvious how it works. The first line printed on the screen is the machine code that the PET PEEKed and converted to Hex. The second line contains the end address, the next address to PEEK, the line number of the last DATA statement, and a GOTO command.

This program is not particularly fast. However, it is all Basic, and makes it easy to copy, write, and change machine language programs. If you are just starting out in machine code, and are not comfortable with the PET Monitor, this is for you!

It can also be modified to work on other computers that have rollover (keyboard memory/buffer), if you know the addresses and codes needed. □

David M. Conley, 10571 Kerrigan Ct., Santee, CA 92071.

```
10 REM**AUTOMATIC DATA READER-POKER
20
30 REM**THIS CONVERTS PEEKS INTO HEX DATA STATEMENTS..EVEN LEVEL I'S  ROM CODE!
40
50 REM**TO LOAD A MACHINE LANGUAGE PROGRAM (IN HEX), RUN 450
60
70 REM**IF ENTERING A HEX LISTING BY HAND, MAKE THE LAST DATA STATEMENT A "*"
80 REM**YOU CAN DOCUMENT YOUR LISTING BY USING A "!" LIKE THIS:
90 REM**     1000 DATA !$033A   ,A9,00,!     LDA $00
100
110 REM**ALL DATA STARTING WITH A "!" WILL BE IGNORED.
120
130 POKE 634,173:POKE 637,141:POKE 638,129:POKE 639,2:POKE 640,96
140
150 DIM D$(16)
160 PRINT "[CLR][3 DOWN]READ MEMORY INTO HEX DATA STATEMENTS:[4 DOWN]":GOSUB 650
170 INPUT "STARTING ADDRESS (HEX)[3 SPACES][SHIFTED ?][3 LEFT]";X$
180 IF X$="[SHIFTED ?]" THEN PRINT "[2 UP]":GOTO 170
190 E=0:GOSUB 670:X=B:IF E=1 GOTO 170
200 INPUT "LAST ADDRESS (HEX)[3 SPACES][SHIFTED ?][3 LEFT]";X$
210 IF X$="[SHIFTED ?]" THEN PRINT "[3 UP]":GOTO 200
220 E=0:GOSUB 670:Y=B:IF E=1 GOTO 200
230 IFX>Y THEN PRINT "[2 DOWN][RVS]HOLD IT![OFF]  YOUR ENDING ADDRESS IS LESS
240 IFX>Y THEN PRINT "THAN YOUR STARTING ADDRESS.  TRY AGAIN.[2 DOWN]"GOTO 170
250 L%=1000
260 PRINT "[CLR]";:GOSUB 650:PRINT L%;"DATA ";
270 GOSUB 370
280 PRINT B$;C$;:IF X=Y THEN PRINT ",*":GOTO 340
290 IF A%=22 THEN L%=L%+10:GOTO 320
300 PRINT ",";:X=X+1:A%=A%+1:GOTO 270
310
320 PRINT:PRINT "Y="Y":X="X+1":L%="L%":GOTO 260
330
340 POKE 525,3:POKE 527,19:POKE 528,13:POKE 529,13:END:FOR 1.0 & 2.0 ROM PETS
350 REM**POKE 158,3:POKE 623,19:POKE 624,13:POKE 625,13:END:FOR 3.0 & 4.0 PETS
360
370 X1%=X/256:X2%=X-X1%*256:POKE 636,X1%:POKE 635,X2%:SYS 634
380 A=PEEK(641):B=INT(A/16):C=INT(A-(B*16)):B=B+1:C=C+1
```

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Authohex, continued...

```
390 B$=MID$(D$,B,1):C$=MID$(D$,C,1):RETURN
400 REM**THIS PROGRAM WRITES THE DATA  STATEMENTS STARTING WITH LINE 1000
410
420
430
440 REM**START LOAD PROGRAM
450 DIM D$(16)
460 PRINT "[CLR][4 DOWN]POKE DATA STATEMENTS INTO MEMORY:[6 DOWN]
470 E=0:INPUT "STARTING ADDRESS (HEX)[3 SPACES][SHIFTED ?][3 LEFT]";X$
480 IF X$="[SHIFTED ?]" THEN PRINT "[2 UP]":GOTO 470
490 GOSUB 650:GOSUB 670:L=B:SY=B
500 IF E=1 GOTO 470
510 PRINT "[CLR][1 DOWN]NOW LOADING.
520 PRINT "[1 DOWN]EACH '*' INDICATES 10 BYTES LOADED.[2 DOWN]
530 READ A$:IF LEFT$(A$,1)="!" GOTO 530
540 C=LEN(A$):IF INT(L/10)=L/10 THEN PRINT "*";
550 IF A$="*"THEN PRINT "[CLR][4 DOWN]SYS"SY"  :REM HEX ADDRESS: $"X$
560 IF A$="*"THEN PRINT "[RVS]PRESS RETURN TO RUN.[OFF][HOME]":STOP
570 IF CC>2 GOTO 730
580 A=ASC(A$)-48:B=ASC(RIGHT$(A$,1))-48:N=B+7*(B>9)-(C=2)*(16*(A+7*(A>9)))
590 IF B>22 GOTO 730
600 IF N<0 OR N>255 GOTO 730
610 POKE L,N
620 IF PEEK(L)=N THEN L=L+1:GOTO 530
630 GOSUB 760:PRINT "[CLR][3 DOWN][RVS]ADDRESS $"B$" IS NOT RAM![OFF]":STOP
640
650 D$="0123456789ABCDEF":RETURN
660
670 IF LEN(X$)>4 THEN PRINT "[1 DOWN]ADDRESS TOO LARGE: TRY AGAIN.[1 DOWN]
680 E=1:RETURN
690 FOR I=1 TO 16:D$(I)=MID$(D$,I,1):NEXT:B=0
700 FOR I=1 TO LEN(X$):FOR J=1 TO 16:IF MID$(X$,I,1)=D$(J). THEN B=B*16+J-1
710 NEXT J,I:RETURN
720
730 GOSUB 760
740 PRINT:PRINT "[1 DOWN]BYTE $"B$" = "A$" ?????":STOP
750
760 B$="":GOSUB 650
770 X=INT(L/16):Y=L-16*X
780 B$=MID$(D$,Y+1,1)+B$:IF X>0 THEN L=X:GOTO 770
790 RETURN
800
810 LINES 1000- RESERVED FOR DATA
820
830 FOR 3.0 AND 4.0 ROM PETS, MAKE THE FOLLOWING CHANGES:
840 (1)  DELETE LINE 130 AND 370
850 (2)  CHANGE LINE 220 TO "GOSUB 380"
860 (3)  SUBSTITUTE LINE 350 FOR LINE 340 (TAKE OUT THE 1ST REM**)
870 (4)  CHANGE THE 1ST STATEMENT IN LINE 380 TO:"A=PEEK(X)"
880 THIS IS BECAUSE NEWER PETS DON'T HAVE THEIR ROM CODE PROTECTED.
890
1000 DATA !THIS IS THE PROGRAM IN LINE 130
1010 DATA !
1020 DATA !$027A ,AD,00,00,!LDA 00   $027B & 7C RESERVED FOR DATA STORAGE
1030 DATA !$027D ,8D,81,02,!  STA $0281
1040 DATA !$0280 ,60,!        RTS
1050 DATA !$0281 ,00,*,!      RESERVED FOR DATA STORAGE
```

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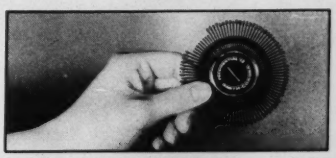

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CIRCLE 143 ON READER SERVICE CARD

Adding Machine Language Routines to Basic

Max Vrugt

For reasons of his own, the author was unable to tell us in this article what computer his spells work on. Readers must guess.

While writing a Basic program for a board game, it occurred to me that it would be nice if a player could point at his move, instead of specifying a numerical input. I wanted a routine that would produce a cursor that could be moved over the entire screen, using the four "arrow" keys on the keyboard. These keys should have a typomatic action, that is, continue their function while depressed. Hitting the enter key should return the current cursor position to my main program. Such a routine would also be useful for menu selection, screen drawings, and word processing applications.

Cursor Movement in Basic

So I wrote a cursor routine in Basic that did what I wanted. However, the cursor moved too slowly because of the Basic overhead (see Figure 1). The program in this example centers on the contents of location 4830H (14400) which contains the status of the enter and arrow keys on the keyboard. If one of these keys is pressed, the corresponding bit of byte 4830H is 1; otherwise it is zero. To detect which key is pressed, I use a series of logical expressions in statement 300 of this routine. In Basic, the true value for a logical expression is -1. This explains the reversed signs in statement 300. Using byte 4830H instead of the INKEY$ function allows for easier programming and faster response time.

Max Vrugt, 183 Millerslane, Kingston, NY 12403.

Figure 1. Cursor routine in Basic, used in menu selection. Point the cursor at the "" in front of desired item and hit enter key. The program indicated by this item will be given control.*

```
100 '*********************************************************
110 '*       EXAMPLE OF A MENU SELECTION                      *
120 '*********************************************************
130 CLS
140 PRINT@270,"MAKE A SELECTION OF REQUIRED FUNCTION";
150 P1=428: P2=492: P3=556: P4=620
160 PRINT@P1,"* FILE DATASET";      '* PRINT MENU ON SCREEN
170 PRINT@P2,"* DELETE DATASET";
180 PRINT@P3,"* COPY DATASET";
190 PRINT@P4,"* RETRIEVE DATASET";
200 CU=364                          '* START CURSOR AT POS 364
210 GOSUB 260:                      '* CURSOR ROUTINE CALL
220 ON 1-(CU=P1)*1-(CU=P2 )*2-(CU=P3)*3-(CU=P4)*4
      GOSUB 210,500,600,700,800    '* EXECUTE THE FUNCTION
                                    '* SPECIFIED IN THE MENU
230 '*********************************************************
240 '*        CURSOR MOVEMENT ROUTINE                         *
250 '*********************************************************
260 SV=PEEK(15360+CU)                '* SAVE SCREEN  CONT.
270 POKE 15360+CU,95                 '* AND DISPLAY CURSOR
280 CO=CU                            '* NEW GETS OLD
290 KE=PEEK(14400)                   '* ARROW OR ENTER ?
300 CU=CO+((KE=8)-(KE=16))*64+(KE=32)-(KE=64) '* WHICH WAY ?
310 CU=CU+((CU>1022)-(CU<0))*1023    '* CURSOR WRAP AROUND
320 POKE 15360+CO,SV                 '* RESTORE SCREEN POS.
330 IF KE=1 THEN RETURN              '* ENTER KEY WAS HIT
340 GOTO 260:                        '* REPEAT
350 '*********************************************************
```

Figure 2. Same cursor routine as in Figure 1. This routine has an MLR stored in DATA statements.

```
100 '*********************************************************
110 '*  EXAMPLE OF MENU WITH USER ROUTINE IN DATA STMNTS      *
120 '*********************************************************
130 CLS:CLEAR 1000
140 RESTORE  '* THE DATA STATEMENTS WILL CONTAIN THE USR RTN.
150 DATA 205,127,010,245,197,213,124,198,060,103,001,255,020
160 DATA 197,030,095,086,115,193,013,032,253,005,032,250,001
170 DATA 255,020,024,003,001,255,192,058,064,056,183,040,247
180 DATA 197,001,000,000,254,001,040,046,254,008,032,003,001
190 DATA 192,255,254,016,032,003,001,064,000,254,032,032,003
200 DATA 001,255,255,254,064,032,003,001,001,000,114,009,124
210 DATA 254,064,056,002,214,004,254,060,048,002,198,004,103
220 DATA 024,179,114,124,214,060,103,193,209,193,241,195,154
230 DATA 010
240 P$=""                            '* LOAD USR RTN IN STRING
250 FOR I=1 TO 105
260   READ X
270   P$=P$+CHR$(X)
280 NEXT I
290 CU=364                           '* INITIATE CURSOR POS.
300 PRINT@270,"MAKE A SELECTION OF REQUIRED FUNCTION";
310 P1=428: P2=492: P3=556: P4=620
320 PRINT@P1,"* FILE DATASET";       '* DISPLAY MENU ON SCREEN
330 PRINT@P2,"* DELETE DATASET";
340 PRINT@P3,"* COPY DATASET";
350 PRINT@P4,"* RETRIEVE DATASET";
360 POKE 16526,PEEK(VARPTR(P$)+1)    '* INITIATE USR ADDR
370 POKE 16527,PEEK(VARPTR(P$)+2)
380 CU=USR(CU)                       '* CALL CURSOR RTN.
390 ON 1-(CU=P1)*1-(CU=P2 )*2-(CU=P3)*3-(CU=P4)*4
      GOSUB 360,400,410,420,430      '* EXECUTE FUNCTION
```

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Machine-Language, continued...

Written in assembly language, this function produced a cursor with a rather high speed (see Figure 2). This routine also uses the contents of byte 4830H. Because of the much higher speed of the cursor, I had to add a delay. There is a long delay, the first time a key is hit, and a short one for the continued movement while the key remains pressed.

This routine saves and restores all used registers with PUSH and POP instructions. I consider this a safer method than using an EXX instruction, because I do not know what the Basic interpreter has been doing before. The CALL 0A7FH at the beginning of the program enters the initial cursor position, passed from the Basic program, into register HL. The JP 0A9AH at the end of the routine, passes the contents of register HL back to the function, making the last location of the cursor available to the main program.

However, to run an application with this machine-language routine (MLR) was rather clumsy. First I had to remember to specify memory size, then SYSTEM load the MLR, hit break, and CLOAD my application. Usually, these two programs are stored together on one tape, leaving the rest of the tape unavailable for other programs and making it impossible to copy without a disk.

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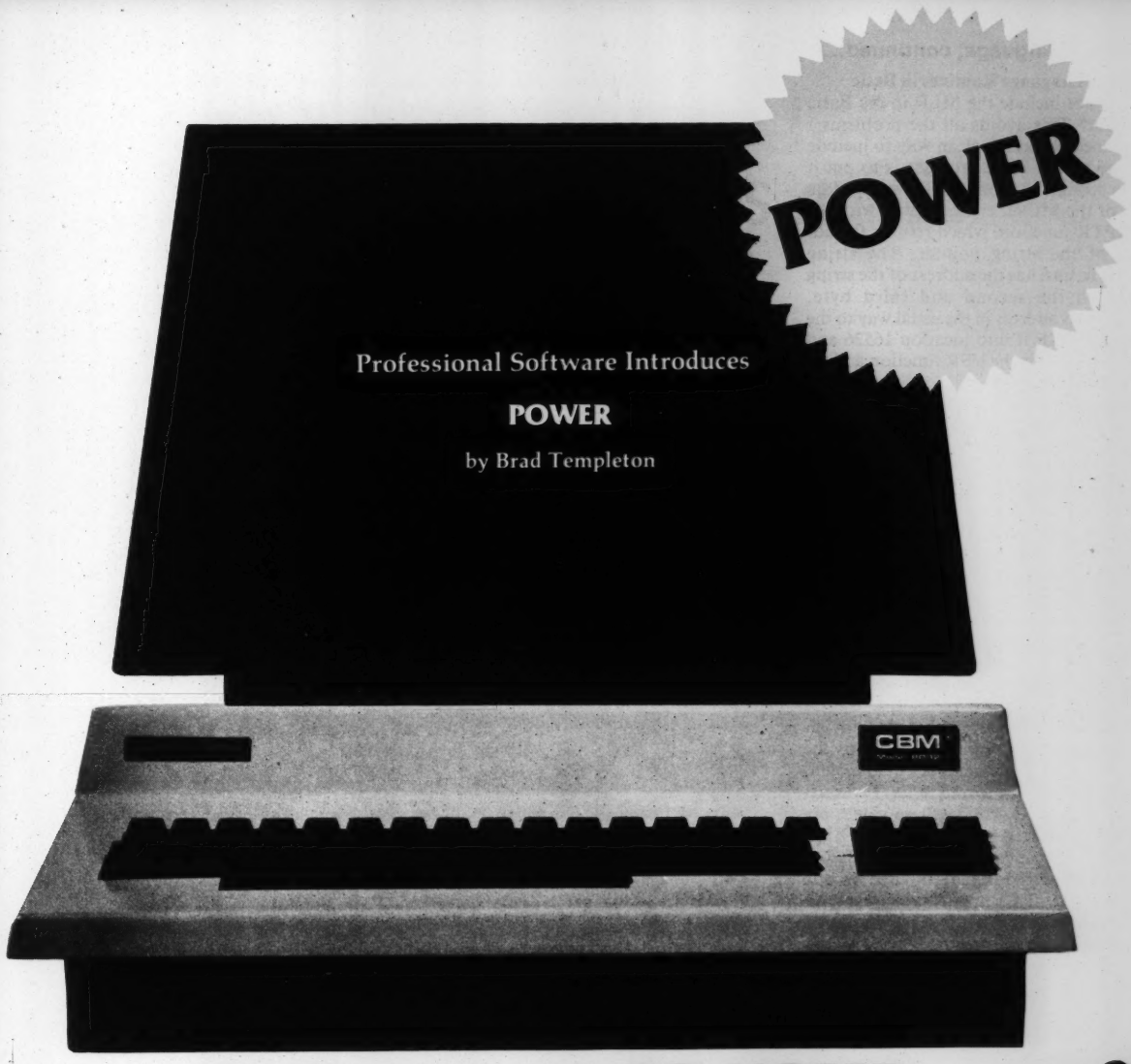
```
                        00100 ;CURSOR MOVE ROUTINE
                        00110 ;AT ENTRY, REG HL POINTS AT CURSOR START POSITION
                        00120 ;AT EXIT, REG HL POINTS AT NEW CURSOR POSITION
7000                    00130          ORG     7000H
7000 6B00               00135 CURSOR   DEFW    PGMLEN      ;2 BYTES PROGRAM LENGTH
7002 CD7F0A             00140          CALL    0A7FH       ;PASS PARAMETER TO HL
7005 F5                 00160          PUSH    AF          ;SAVE REGS
7006 C5                 00170          PUSH    BC
7007 D5                 00180          PUSH    DE
7008 7C                 00190          LD      A,H         ;CONVERT REL. SCREEN POS.
7009 C63C               00200          ADD     A,3CH
700B 67                 00210          LD      H,A         ;HL POINTS TO REAL ADDR
700C 01FF14             00220          LD      BC,14FFH    ;SET INITIAL DELAY
700F C5                 00230          PUSH    BC
7010 1E5F               00240          LD      E,95        ;CURSOR DISPLAY CHAR.
7012 56                 00250 MOVE     LD      D,(HL)      ;SAVE CONTENT OF LOC
7013 73                 00260          LD      (HL),E      ;DISPLAY CURSOR
7014 C1                 00270          POP     BC          ;USE BC FOR DELAY
7015 0D                 00280 DELAY    DEC     C           ;DELAY
7016 20FD               00290          JR      NZ,DELAY
7018 05                 00300          DEC     B
7019 20FA               00310          JR      NZ,DELAY
701B 01FF14             00320          LD      BC,14FFH    ;SET SHORT DELAY
701E 1803               00330          JR      CONT
7020 01FFC0             00340 AGN      LD      BC,0C0FFH   ;SET LONG DELAY
7023 3A4038             00350 CONT     LD      A,(3840H)   ;KB CONTR KEYS
7026 B7                 00360          OR      A           ;KEYS DEPRESSED ?
7027 28F7               00370          JR      Z,AGN       ;NO, TRY AGAIN
7029 C5                 00380          PUSH    BC          ;SAVE DELAY
702A 010000             00390          LD      BC,0        ;WHICH KEY ?
702D FE01               00400          CP      1           ;ENTER ?
702F 282E               00410          JR      Z,RET       ;EXIT ROUTINE
7031 FE08               00420          CP      8           ;UP ?
7033 2003               00430          JR      NZ,NOUP
7035 01C0FF             00440          LD      BC,-64
7038 FE10               00450 NOUP     CP      16          ;DOWN ?
703A 2003               00460          JR      NZ,NODWN
703C 014000             00470          LD      BC,64
703F FE20               00480 NODWN    CP      32          ;LEFT ?
7041 2003               00490          JR      NZ,NOLFT
7043 01FFFF             00500          LD      BC,-1
7046 FE40               00510 NOLFT    CP      64          ;RIGHT ?
7048 2003               00520          JR      NZ,NORGHT
704A 010100             00530          LD      BC,1
704D 72                 00540 NORGHT   LD      (HL),D      ;RESTORE CONTENT OLD LOC
704E 09                 00550          ADD     HL,BC       ;NEW  CURSOR POSITION
704F 7C                 00560          LD      A,H         ;WITHIN SCREEN LIMIT ?
7050 FE40               00570          CP      40H         ;OFFSCREEN TO RIGHT ?
7052 3802               00580          JR      C,NORT      ;NO
7054 D604               00590          SUB     04H         ;BRING CURSOR BACK
7056 FE3C               00600 NORT     CP      3CH         ;OFFSCREEN TO LEFT ?
7058 3002               00610          JR      NC,NOLF     ;NO
705A C604               00620          ADD     A,04H       ;BRING CURSOR BACK
705C 67                 00630 NOLF     LD      H,A         ;HL CONTAINS NEW POS.
705D 18B3               00640          JR      MOVE        ;MORE CURSOR MOVES ?
705F 72                 00650 RET      LD      (HL),D      ;RESTORE SCREEN
7060 7C                 00660          LD      A,H         ;CONVERT ADDR TO
7061 D63C               00670          SUB     3CH         ;REL. SCREEN POS.
7063 67                 00680          LD      H,A
7064 C1                 00690          POP     BC          ;REMOVE DELAY
7065 D1                 00700          POP     DE          ;AND RESTORE REGS
7066 C1                 00710          POP     BC
7067 F1                 00720          POP     AF
7068 C39A0A             00730          JP      0A9AH       ;RETURN TO MAIN
006B                    00735 PGMLEN   EQU     $-CURSOR    ;PROGRAM LENGHT
0000                    00740          END
00000 TOTAL ERRORS

AGN     7020 00340   00370
CONT    7023 00350   00330
CURSOR  7000 00135   00735
DELAY   7015 00280   00290 00310
MOVE    7012 00250   00640
NODWN   703F 00480   00460
NOLF    705C 00630   00610
NOLFT   7046 00510   00490
NORGHT  704D 00540   00520
NORT    7056 00600   00580
NOUP    7038 00450   00430
PGMLEN  006B 00735   00135
RET     705F 00650   00410
```

Figure 2a. Assembler listing of MLR used in Figure 2.



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Machine Language Routines in Basic

Why not include the MLR in my Basic program? This avoids all the problems I mentioned earlier. A clean way to include such code in a Basic program is to put it into a string. The start of this string, (the start of the MLR), can be found with the VARPTR function, which returns the address of the string pointer. The string pointer in turn has the address of the string stored in the second and third byte. Passing this address in the usual way to the system (POKE it into location 16526 and 16527) initializes the USR function and we are in business.

But a string with hex values cannot be used in a Basic program. Not every hex value between OOH and FFH has an ASCII character representation, and even if these values could be put into a string, the correct operation of the Basic interpreter would be disrupted. Some hex values are used as interpreter controls. For example, the value OOH is used by the Basic interpreter as an end of line marker.

This means that we have to create the string at execution time. At that time, strings are created in the string space outside the Basic program and their content cannot disturb the interpreter. But it is necessary to store the data and initialize the string somewhere inside the program. The decimal values of the bytes of the MLR can be stored in DATA statements. During execution these values are READ, converted to hex with the CHR$ function and concatenated to the string.

Translating the hexadecimal codes and typing the DATA statements causes errors and is a boring effort. The computer should take care of this task; so I wrote a copy program (listed in Figure 3) to do this job.

The program first CLOADs the user's Basic program into storage, consecutive to itself. Then the MLR is translated and DATA statements, created at the end of the Basic program, contain the decimal

Figure 3. Copy program. This program concatenates Basic programs in storage, converts MLR hex codes to decimal and generates DATA statements.

```
10 '*************************************************************
11 '*  PROGRAM TO MOVE USR RTN INTO BASIC PROGRAM                *
20 '*************************************************************
30 DEFINT A-Z
40 PRINT"FIRST 2 BYTES OF OBJECT USR RTN MUST CONTAIN LENGHT !"
50 CLS:      INPUT "DID YOU LOAD THE OBJECT RTN --- Y/N" ;Y$
60 IF Y$=LEFT$("NO",LEN(Y$)) THEN PRINT "PLEASE CORRECT":END
70 'PREPARE FOR MERGE WITH USER APPLICATION PROGRAM
80                      'MOVE PROGRAM END ADDR (16633,16634)
90                      'INTO PROGRAM START ADDR (16548,16549)
100 PRINT @640,"";
110 PRINT "CLOAD YOUR PROGRAM "
120 PRINT "WHEN READY KEY IN FOLLOWING STATEMENTS"
130 PRINT "      POKE 16548,233"
140 PRINT "      POKE 16549,66"
150 PRINT "THEN GIVE THE COMMAND "
160 PRINT "      RUN 200"
170 EP=PEEK(16633)+256*PEEK(16634)   'GET END OF PROGR ADDR
180  VR=EP-2: AD=16548: GOSUB 920:   'AND PUT IN PGM START PTR
190 END
200 '*************************************************************
210 '**** USER PROGRAM IS NOW LOADED BEHIND THIS PROGRAM ****
220 'THIS PROGRAM USES FOLLOWING VARIABLES:
230 ' US : USR START ADDR              UL : USR LENGTH
240 ' UE : USR END ADDR                PE : BASIC PGM END ADDR
250 ' NE : BASIC PGM NEW END ADDR      NP : NEXT LINE PTR
260 ' LP : LINE NUMBER PTR             TP : TEXT PTR
270 ' EL : END OF LINE MARKER ADDR     EF : END OF FILE MARKER
280 ' LN : LINE NUMBER
290 DEFINT A-Z
300 INPUT "USR ROUTINE START ADDRESS, PLEASE ";US
310       UL=PEEK(US)+256*PEEK(US+1)      'USR RTN LENGHT
320       PE=PEEK(16633)+256*PEEK(16634) 'BASIC PGM END
330         DL=INT(UL/13)*58
340            DD=UL-INT(UL/13)*13
350            IF DD>0 THEN DL=DL+6+DD*4
360       NE=PE+DL                        'NEW BASIC PGM END
370 'THE NEW PROGRAM END INCLUDES THE NECESSARY DATA STMNTS
380 'SAVE US,UL,PE,NE AND CHANGE END OF PROGRAM ADDR TO NEW
390        VR=US: AD=32766: GOSUB 920:    'SAVE US
400        VR=UL: AD=32764: GOSUB 920:    'SAVE UL
410        VR=PE: AD=32762: GOSUB 920:    'SAVE PE
420        VR=NE: AD=32760: GOSUB 920:    'SAVE NE
430 POKE 16634,PEEK(32761)          'CHANGE END OF BASIC PGM
440 POKE 16633,PEEK(32760):RUN 450  'PTR, CONTINUE EXECUTION
450 DEFINT A-Z
460        US=PEEK(32766)+256*PEEK(32767)   'RESTORE US
470        UL=PEEK(32764)+256*PEEK(32765)   'RESTORE UL
480        PE=PEEK(32762)+256*PEEK(32763)   'RESTORE PE
```


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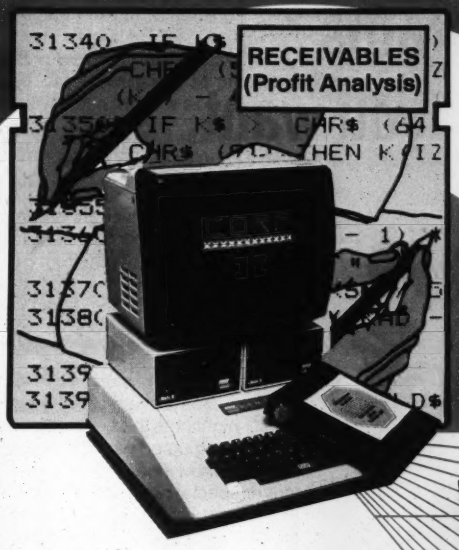

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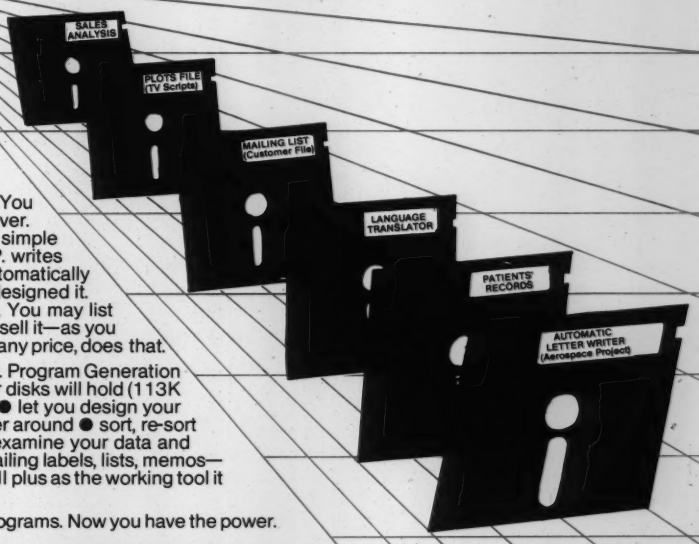

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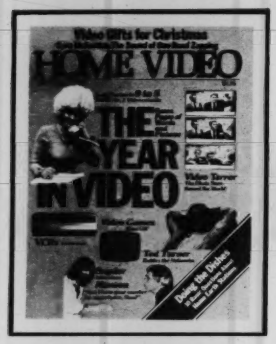

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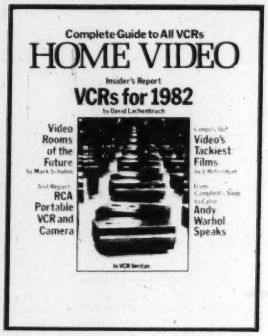

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values of the bytes of the MLR. Upon successful completion the copy program deletes itself, leaving behind the user's Basic program, including the newly-created DATA statements. This Basic program may be saved for later use or executed immediately and saved after debugging. It is not necessary to CLOAD a user program. If you bypass this part of the program (start with RUN 200), only the DATA statements are created.

The copy program needs the location of the start of the MLR. The length of the MLR is expected in the first two bytes of the MLR. An easy way to provide this information in a MLR is as follows.

```
        ORG load address
LENGTH  DEFW  ENDPGM-BEGPGM  ;first MLR instruction
BEGPGM (MLR first instruction     )
        |
        (MLR program instructions)
        |
ENDPGM EQU $                 ;last MLR instruction
```

The last assembler pseudo-instruction assigns the address of the end of the MLR program to variable ENDPGM. The definition at the beginning of the program loads the difference between the program start and end address into the first two bytes labelled LENGTH. This length is also stored in the first two entries of the first DATA statement and can be used to control the loop variable of the READ loop in the Basic program. The length of the program can include the two length bytes or not according to your needs. You can easily change this if you want.

Concatenating Basic Programs

To load a Basic program after a program is already in storage, reset the Basic program start address pointer and do the following:

1) First load the current Basic program end address (minus 2) into this pointer.
2) Next CLOAD the next Basic program, starting at the address in the program start address pointer (the last program's end address).
3) When the CLOAD is complete, restore the Basic program start address pointer to its original value. In this case there is no need to renumber the programs because only the first program is executed and this program deletes itself when it completes execution. Thus there is no conflict in line numbering.

Creating Space

Before the copy part of the program starts to execute, you must make room for the new DATA statements. This changes the end-of-program address. Because the end of the program is also the start of the simple variable space, we are in trouble. Changing the end of the program destroys already-defined variables and pointers and makes them unusable. To move these already-defined variables behind the newly-defined end of the program is not possible because the process involves using variables.

Rather than doing a lot of housekeeping that the system can do, let's take an easy way out. Before changing the end-of-program pointer, save the necessary variables in high core, using POKEs. Assume that these locations are not used, otherwise redefine these addresses for your own configuration. Next change the end-of-program pointer, with POKEs without variables (using PEEKs from high storage). Now the copy program needs to be reinitialized, because the interpreter has lost track of its allocated variables.

Execution of the RUN 450 statement resets all parameters and variables and starts to execute line 450. Thus you restore the variables saved earlier into redefined variables and you are ready to start the creation of DATA statements.

Generating Data Statements

To understand the part of the program that creates the DATA statements, you need to understand the structure of a Basic program line as stored in memory. The structure of such a line is:

Two bytes containing a pointer to the next Basic line.

Two bytes containing the line number.

The actual line contents.

One byte containing an end-of-line marker (OOH).

Two bytes containing OOH follow the last line of the Basic program and indicate the end-of-program (EOP) marker. Remember that you changed the end-of-program pointer to make space for the DATA statements, but the EOP marker is still there and indicates the original program end.

Figure 3, continued.

```
490 'FIND START OF LAST STMNT TO PICK UP LINE NUMBER
500 FOR EL=PE-4 TO PE-260 STEP -1    'SEARCH BACKWARDS
510  IF PEEK(EL)=0 THEN GOTO 550:    'END OF LINE MARKER FOUND
520 NEXT EL
530   PRINT "END OF LINE MARKER NOT FOUND"
540 STOP
550 LN=PEEK(EL+3)+256*PEEK(EL+4)     'GET LAST LINE NUMBER
560 NP=PE-2                          'INITIAL NEXT LINE PTR
570 US=US-1                               'ADJUST START
580 FOR K=1 TO UL STEP 13                 'FIRST BYTE TO MOVE
590  KE=K-12*(K+12<=UL)-(UL-K)*(K+12>UL) 'LAST BYTE TO MOVE
600                                       'INTO A DATA STMNT
610 'BUILD A COMPLETE DATA STATEMENT
620 LN=LN+1                          'NEW LINE NUMBER
630 LP=NP+2                          'LINE NUMBER PTR
640    VR=LN: AD=LP: GOSUB 920:      'PUT NEW LINE NUMBER
650 TP=LP+2                          'TEXT PTR
660     POKE TP,136                  'PUT CODE FOR DATA STMNT
670     POKE TP+1,32                 'FOLLOWED BY SPACE IN TXT
680 TP=TP+2                          'POINT AT NEXT AVAIL BYTE
690    'MOVE 13 BYTES (OR LESS) FROM USR TO DATA STMNT
700   FOR I=K TO KE
710     X=PEEK(US+I):  D=1000        'GET NEXT BYTE FROM USR
720         FOR L=1 TO 3             'CONVERT BYTE TO DEC
730           D=D/10:  X1=INT(X/D)
740           POKE TP,X1+48          'STORE DEC IN DATA STMNT
750           TP=TP+1
760           X=X-X1*D
770         NEXT L
780     POKE TP,ASC(",")             'PLACE COMMA
790     TP=TP+1                      'UPDATE TEXT PTR
800     PRINT CHR$(132);             'I AM STILL ALIVE
810   NEXT I
820   PRINT "BYTES";K;" TO";KE;" HAVE BEEN MOVED"
830 EL=TP-1                          'OVERWRITE LAST COMMA WITH
840 POKE EL,00                       'AN END OF LINE MARKER
850 VR=EL+1: AD=NP: GOSUB 920:       'UPDATE NEXT LINE POINTER
860 NP=TP
870 NEXT K
880 VR=00: AD=NP: GOSUB 920:         'END OF PROGRAM MARKER
890   PRINT "USER ROUTINE SUCCESSFUL COPIED"
900 DELETE 10-970                     'DELETE PROGRAM
910 END
920 'SUBROUTINE TO POKE A WORD FROM VARIABLE VR INTO ADDRESS AD
930 HI=INT(VR/256)
940 POKE AD+1,HI
950 LO=VR-INT(VR/256)*256
960 POKE AD,LO
970 RETURN
```

Copying MLR to Data Statements

The copy program starts searching for the first end of line (EOL) marker to the left of the last EOL marker. Three bytes to the right of this EOL marker is the number of the last line used in the user's Basic program. The DATA statement line numbers are based on the last line number of the Basic program with an increment of one. Now you can create the first DATA statement and write it over the EOP marker. Continue this process until all the bytes of the MLR are copied. Each DATA statement contains 13 elements (or less, if it is the last one).

There are two restrictions in this process.

Due to a Basic interpreter restriction, you cannot create a string longer than 255 characters.

Because an MLR is moved around in storage, it should not contain code which is dependent on its location in storage.

The first restriction limits you to MLRs with a length of 255 bytes or less. Because of the nature of the MLRs used in a Basic program, I do not view this as a limitation. MLRs are usually rather short programs. However, if you do have longer programs, there are two solutions:

Split your program into two or more 255-byte MLRs and store them in several strings that you call successively from your Basic program.

Store your MLR in successive defined strings, thus forming one large area in storage. You must realize that string space is defined from high memory down. To explain this, let's look at an example.

```
100 P$="1": FOR I=1 TO 3:
    P$=P$+"P": NEXT I
200 Q$="2": FOR I=1 TO 3:
    Q$=Q$+"Q": NEXT I
```

This routine eventually creates the following sequence in storage:

2QQQ2QQ2Q1PPP1PP1P starting at 32750, ending at 32767. The pointers point at 32750 for Q$ and 32759 for P$. Eventually the garbage between these strings will be collected, but the strings are still in the wrong order. Thus, after creating P$ and Q$, it is necessary to issue the statement 300 P$=P$, immediately after creating string Q$. Now P$ and Q$ are in the right order and concatenated in storage. Changing any of the two strings in your program from this point on destroys the concatenation again! A safe practice is to redefine your strings in opposite order of creation and not to touch them anymore. In this example write

```
300 Q$=Q$
400 P$=P$
```

Changing any of the two strings in your program from this point on destroys the concatenation again!

Collection of garbage at certain times, due to a need for string space, moves strings around but does not destroy their order of sequence. This means that before every USR call you must POKE the MLR start address, because it may have been changed.

The second restriction requires self-relocating MLRs. A self-relocating program can be loaded into any area of available storage, and contains an initialization routine to adjust its address constants so that it can be executed at that location.

There are several ways to write a self-relocating program.

If you do not use address constants in your program, it will always be self-relocating. In that case you do not need an initialization routine. You can write a program without address constants if you do not use DEFs and JPs (absolute jumps). All data must be handled and stored (stacked) through registers. The system makes 16 bytes available in the system stack, (usually sufficient space). All jumps must be relative (JR). Relative jumps have a range from −126 to 129. This is sufficient for most routines. If you use CALLs then the called routine must be at an absolute address.

The indexed addressing mode of the Z-80 provides another means of self-relocating. Use registers IX and IY as your base registers. Each address constant is formed of a combination of a base value and a displacement. Changing the base value relocates your program.

The third way is to have an initialization routine. This routine detects the difference between assembled and loaded start address. Then all address constants are changed by this delta, which may be positive or negative.

It is also possible to write your own relocating loader, independent of any particular application. However, the way that the Z-80 has implemented its opcodes makes it rather complicated to write such a program efficiently.

The cursor routine and the resulting copy program can be used for many other applications. Currently, I am using slightly modified versions of these programs to design and save complex screen layouts. The modified cursor routine allows me to make any drawing on the screen. The copy program saves the layout in DATA statements. These DATA statements can be used in another program to build a screen. It is also possible in this way to define protected screen areas and areas to be used for input. □

Bit Pit

Chas Andres

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Structured Design with Basic?

An example and an answer

Phil Hughes

We all seem to be willing to waste a lot of time in small increments to save having to drop everything and get what we need to do a job right. I am no exception. For months, I have been looking at listings to see if two files were the same or if one had been updated. Finally, this morning, I decided to write a file-compare utility.

I had just finished reading David Higgins' book entitled *Program Design and Construction*. Thus, his ideas for structured design using Warnier-Orr charts were fresh in my mind. For the past couple of years I have tried to be structured in my approach to design and programming but the structure always gets lost along the way. I was impressed with the book so I decided to play it by the rules and see what would happen.

Being skeptical, I decided to keep track of the time I would spend writing and debugging the compare program. My estimate was eight hours, although I felt I could kluge it out in around four. I figured it was worth the other four hours just to see if structured design really works.

Armed with a copy of *Program Design and Construction*, I sat down to do the design. The program requirements were simple: it should read two specified files, compare each record, print all records that differ between the files and when done, print both record and error counts. The program should also handle all input/output (I/O) errors.

Fifty minutes later I had produced Charts 1 through 7. They seemed to follow the rules outlined in the book and I could understand what they said. For only fifty minutes work, I was impressed.

Phil Hughes, Specialized Systems Consultants, P.O. Box 2847, Olympia, WA 98507.

Chart 1.

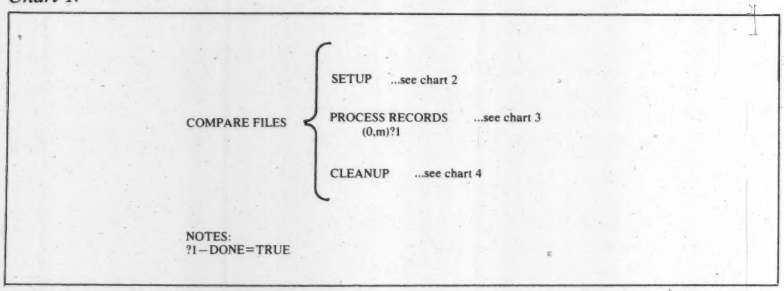


Chart 2.

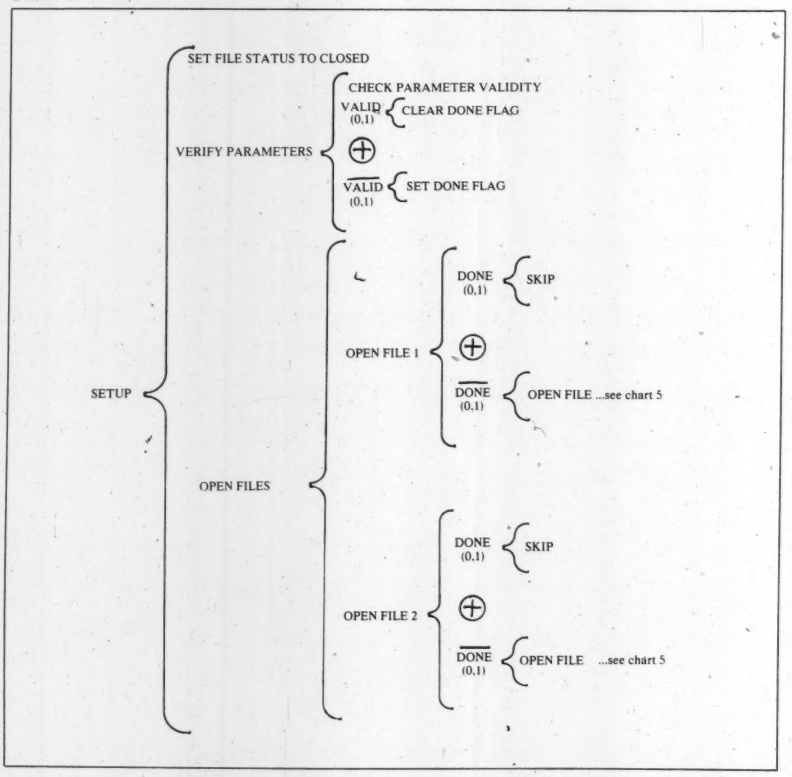


Chart 3.

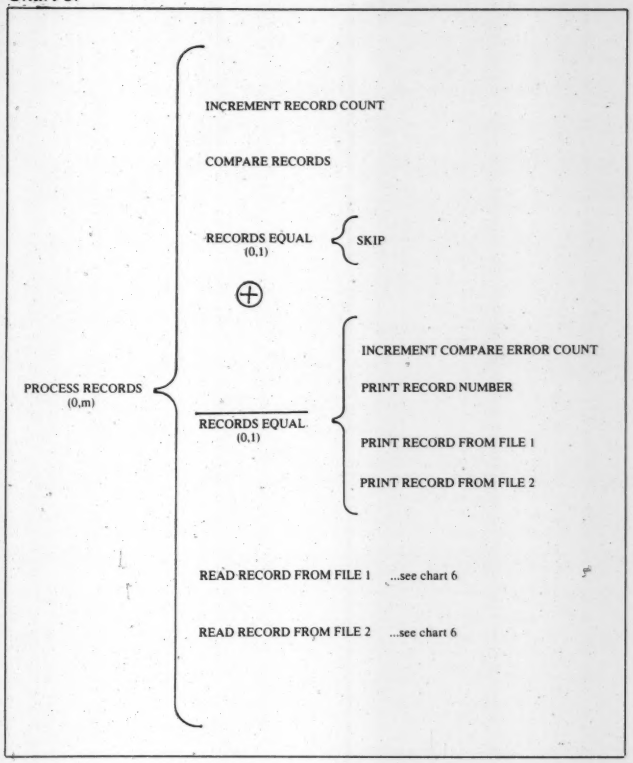


Chart 4.

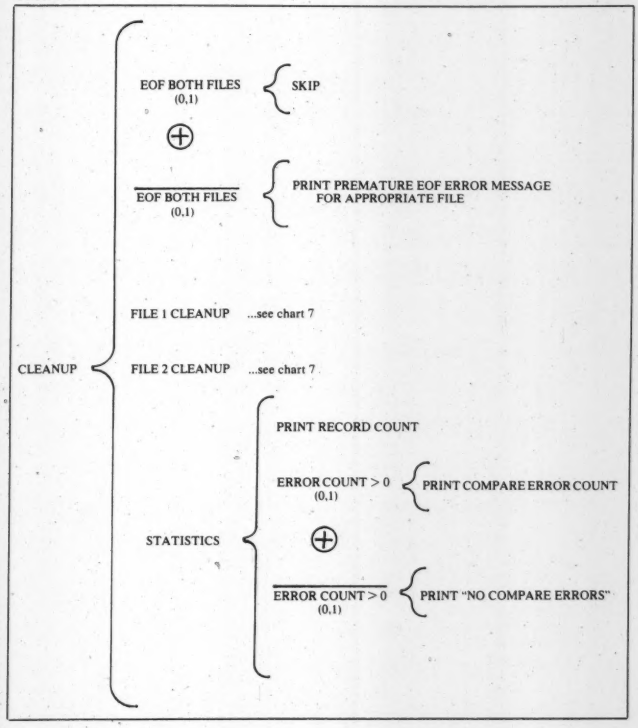


Chart 5.

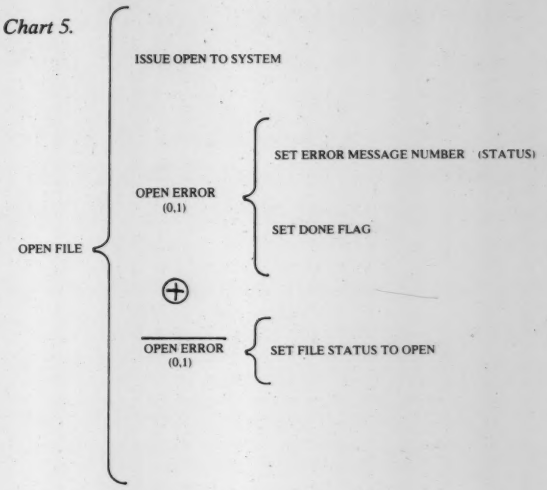


Chart 6.

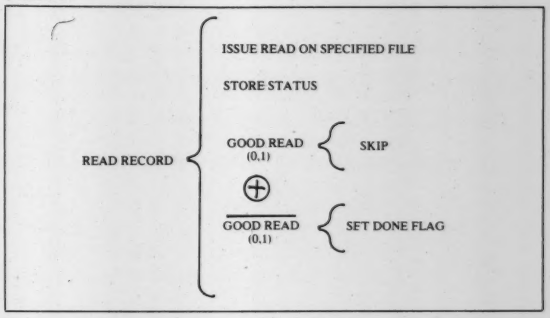
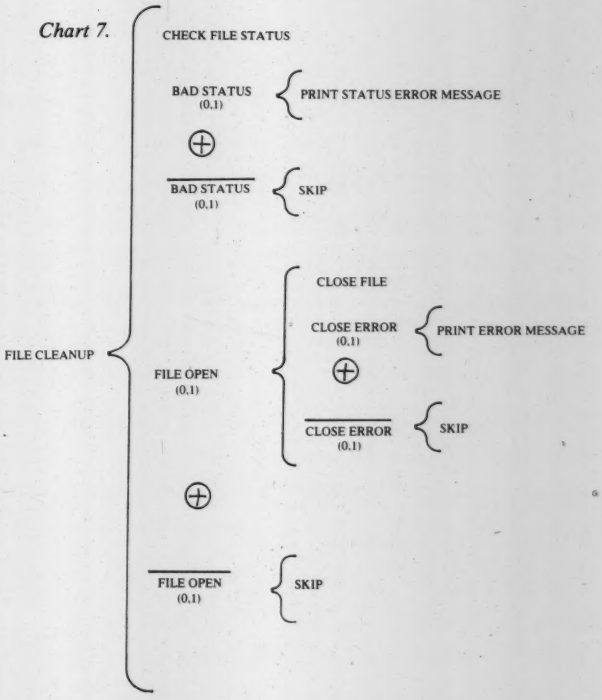


Chart 7.



The next decision was to select the programming language I would use to code the file compare. I had considered Pascal and assembler earlier. Pascal seemed like the logical choice; a structured language for a structured design. In the book Mr. Higgins had shown that the techniques he presented could be implemented in Basic. In fact, Basic was the only language used, and his design techniques had worked so well I decided to give Basic a try.

I checked the time and started writing code. As per his suggestions, I had all kinds of little subprograms and lots of GOSUB statements. Fifty-two minutes later I met my next surprise. I was all out of subprograms to code. I quickly compared the code to the chart. I found the way that seemed correct instead of following the chart. Recording to correct my error took another five minutes.

Next, I started typing. Typing took about 35 minutes including time to correct my obvious typographical errors. Listing 1 shows the program that I had produced.

Listing 1. Listing of program CMP-1.

```
 1 REM FILE COMPARE 1-24-80
 5 REM VARIABLE USAGE
10 REM F=Current file number
20 REM S(1),S(2)=File status
30 REM B$(1),B$(2)=Record buffers
40 REM F$(1),F$(2)=File names
50 REM D=Done flag (1=TRUE)
60 REM R=Record number
70 REM E=Number of record compare errors
80 REM **********
90 EF=8 :REM EOF Status
95 REM **********
100 REM MAIN PROGRAM
110 GOSUB 500 : REM Setup
120 REM Process records (0,n)
130 IF D=1 THEN GOSUB 1000 ELSE 150
140 GOTO 120
150 GOSUB 1500 : REM Cleanup
160 END
170 REM **********
500 REM SETUP
510 S(1)=-1
520 S(2)=-1
530 GOSUB 2100:REM Get parameters
540 GOSUB 2200 : REM Open file 1
550 GOSUB 2300 : REM Open file 2
560 IF DONE=0 THEN GOSUB 2400 : REM Read first records
570 RETURN
580 REM **********
1000 REM PROCESS RECORDS
1010 R=R+1
1015 REM Compare
1020 IF B$(1)<>B$(2) THEN GOSUB 2000
1030 REM Read next records
1040 F=1
1050 GOSUB 7000
1060 F=2
1070 GOSUB 7000
1080 RETURN
1090 REM **********
1500 REM CLEANUP
1510 IF NOT((S(1)=EF)AND(S(2)=EF)) THEN GOSUB 3000
1520 F=1:GOSUB 3200
1530 F=2:GOSUB 3200
1540 GOSUB 3500 : REM Statistics
1550 RETURN
1560 REM **********
2000 REM RECORDS NOT EQUAL
2010 E=E+1
2020 PRINT:PRINT "RECORD #";R
2030 PRINT B$(1)
2040 PRINT B$(2)
2050 RETURN
2060 REM **********
2100 REM GET PARAMETERS
2110 INPUT "ENTER FIRST FILE NAME",F$(1)
2120 INPUT "ENTER SECOND FILE NAME",F$(2)
2130 D=0
2140 RETURN
2150 REM **********
2200 REM OPEN FILE 1
2210 IF DONE=0 THEN 2220 ELSE 2240
2220 F=1
2230 GOSUB 7200
2240 RETURN
2250 REM **********
2300 REM OPEN FILE 2
2310 IF DONE=0 THEN 2320 ELSE 2340
2320 F=2
2330 GOSUB 7200
2340 RETURN
2350 REM **********
3000 REM PREMATURE EOF ERROR
3010 PRINT "PREMATURE EOF ON FILE";
3020 IF S1=EF THEN PRINT F$(2) ELSE PRINT F$(1)
3030 RETURN
3040 REM **********
3200 REM FILE CLEANUP
3210 IF (S(F)>0)AND(S(F)<>EF) THEN 3220 ELSE 3230
3220 PRINT "STATUS ERROR";S(F);"ON FILE";F$(F)
3230 IF S(F)>=0 THEN 3240 ELSE 3270
3240 ON ERROR GOTO 3300
3250 CLOSE F
3260 ON ERROR GOTO 0
3270 RETURN
3300 REM error handler
3310 PRINT "CLOSE ERROR ON";F$(F)
3320 RESUME 3260
3330 REM **********
3500 REM STATISTICS
3510 PRINT R;"RECORDS PROCESSED"
3520 IF E>0 THEN PRINT E;"COMPARE ERRORS"
3530 IF E=0 THEN PRINT "NO COMPARE ERRORS"
3540 RETURN
3550 REM **********
7000 REM READ RECORD FROM FILE F
7010 ON ERROR GOTO 7100
7020 INPUT #F,B$(F)
7030 ON ERROR GOTO 0
7040 RETURN
7100 REM error handler
7110 S(F)=ERR
7120 RESUME 7030
7130 REM **********
7200 REM OPEN FILE F
7210 ON ERROR GOTO 7300
7220 OPEN OLD F$(F) AS F
7230 ON ERROR GOTO 0
7240 IF S(F)>0 THEN D=1
7250 RETURN
7300 REM error handler
7310 RESUME 7230
7320 REM **********
```

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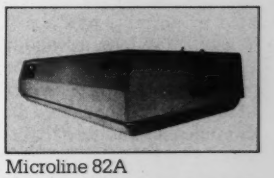

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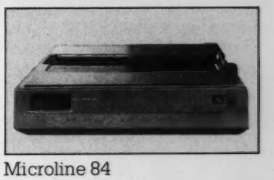

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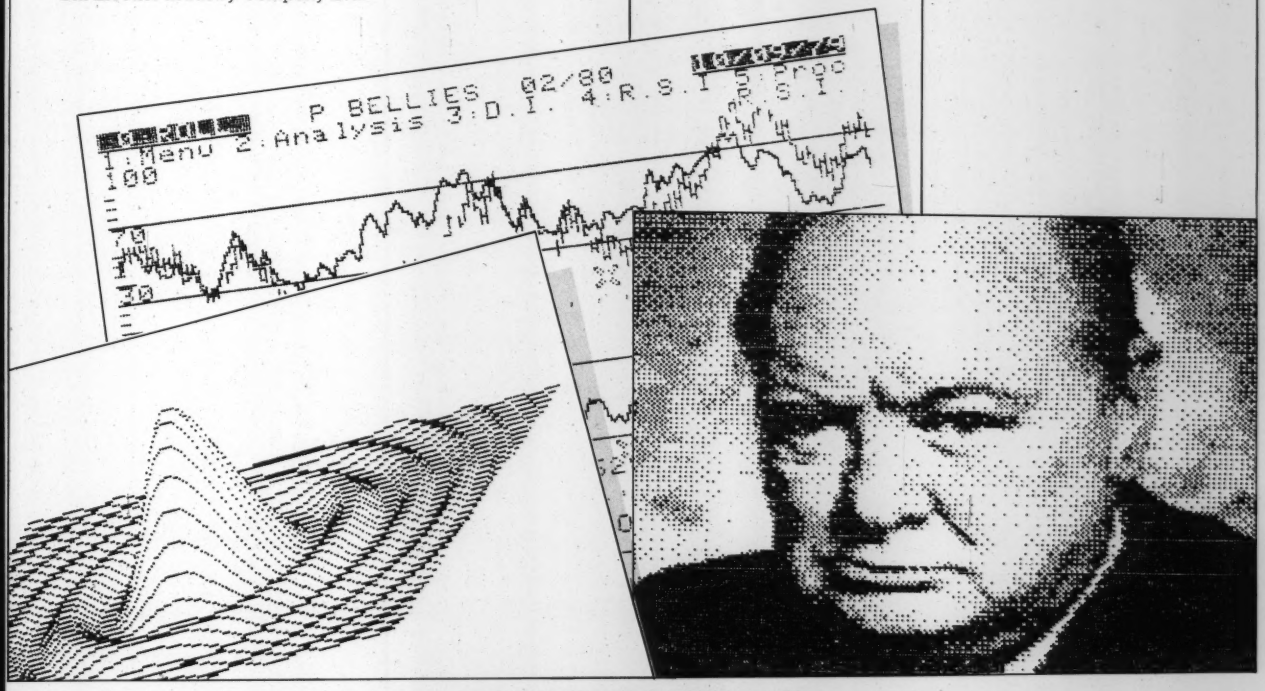


CIRCLE 214 ON READER SERVICE CARD

Listing 2. Run of CMP-1.

```
RUN

ERROR #78 AT LINE 510

READY
```

I entered RUN and was immediately greeted by an error message (Listing 2). This was caused by an undimensioned variable. I added a DIM statement for all the variables described as arrays in the REM statements at the start of the program. At this time I also noticed that I had failed to enter the READ FIRST RECORDS subroutine (lines 2400-2460). I entered these lines.

My second attempt at execution is shown in Listing 3. I entered two file names in response to the prompts and was greeted this time by an error message from the program rather than Basic. There appeared to be a couple of problems, one relating to getting an EOF (end of file) before I should and another indicating that I only got an EOF on one of the files. I decided to do a little proofreading and found the following.

I had entered DONE for the variable name of the done flag in lines 560, 2210 and 2310. Although DONE was clearly an invalid variable name, Basic had failed to produce an error message. I fixed these lines, changing DONE to D, and took a look at the test for premature EOF at line 1510. It did what was described in the blocks EOF BOTH FILES and EOF BOTH FILES in the Warnier chart, but it didn't look right. That's because I had charted it wrong. The condition I wanted was EOF ON ONE FILE ONLY. Chart 8 shows the updates to Chart 4 to implement this correction. This was translated into lines 1510 and 1515 in the code.

Listing 4 shows my next attempt to run the program. This time it seemed to read from disk for a while, then it stopped. I finally hit the break key. The line it stopped on (1020) was the compare of the two record buffers. I printed their contents to see how far it had run. The final records of the files were in the buffers. Printing the record counter (R) and the done flag (D) revealed that the program thought it was on record 249 and still not done.

There were nowhere near 249 records in the file so it looked like the done flag was not being set when an EOF occurred. Looking at the Warnier chart showed that the done flag should be set in the READ RECORD subroutine. Scanning the listing (lines 7000-7130) showed that I had left out this important statement. At line 7115 I added a D=1 and was off to try again.

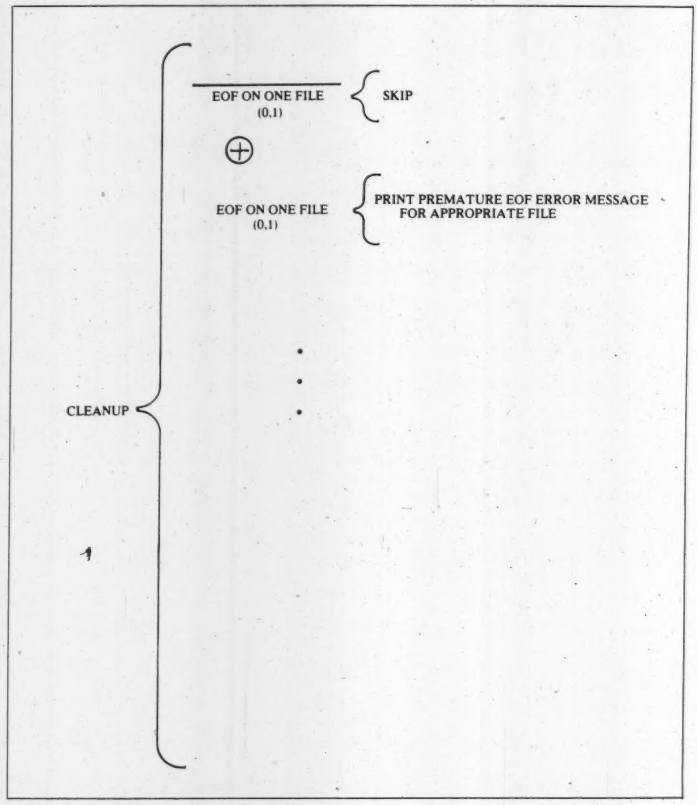
Listing 3. Run of CMP-2.

```
RUN

ENTER FIRST FILE NAME? 1.CMP-1.BAS
ENTER SECOND FILE NAME? 1.CMP-1.BAS
PREMATURE EOF ON FILE1.CMP-1.BAS
 0 RECORDS PROCESSED
NO COMPARE ERRORS

READY
```

Chart 8. Revision to Chart 4.



Listing 4. Run of CMP-3.

```
RUN

ENTER FIRST FILE NAME? 1.CMP-1.BAS
ENTER SECOND FILE NAME? 1.CMP-1.BAS

BREAK AT LINE 1020

READY

PRINT B$(1),B$(2)
7320 REM **********          7320 REM **********


READY

PRINT R,D
 249            0

READY
```

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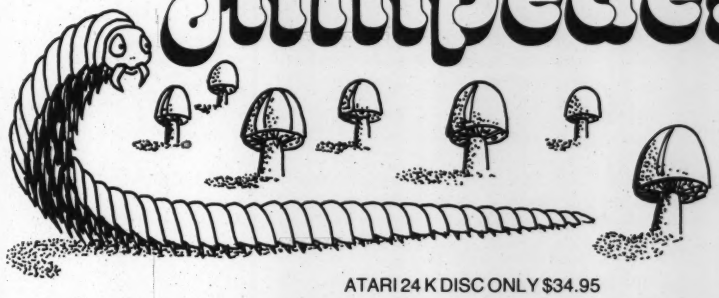

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This time the program seemed to work. Amazing! I cleaned up a few of my typos so the spacing would be correct in the error messages and ran some more tests. Listing 5 shows the results. First I compared a file to itself. I got a valid record count and no errors. Next I compared the current version of the program to the previous version. The first three compare errors show the changes I made to correct spacing in the error messages. The fourth error (record 112) is a result of adding the D=1 statement at line 7115. At this point all records show compare errors because of the added line in one file. Finally, the error messages came out correctly.

Listing 5. Run of CMP-4.

```
RUN

ENTER FIRST FILE NAME? 1.CMP-1.BAS
ENTER SECOND FILE NAME? 1.CMP-1.BAS
 113 RECORDS PROCESSED
NO COMPARE ERRORS


READY

RUN

ENTER FIRST FILE NAME? 1.CMP-3.BAS
ENTER SECOND FILE NAME? 1.CMP-4.BAS

RECORD # 83
3010 PRINT "PREMATURE EOF ON FILE";
3010 PRINT "PREMATURE EOF ON FILE ";

RECORD # 89
3220 PRINT "STATUS ERROR";S(F);"ON FILE";F$(F)
3220 PRINT "STATUS ERROR ";S(F);" ON FILE ";F$(F)

RECORD # 96
3310 PRINT "CLOSE ERROR ON";F$(F)
3310 PRINT "CLOSE ERROR ON ";F$(F)

RECORD # 112
7120 RESUME 7030
7115 D=1

RECORD # 113
7130 REM **********
7120 RESUME 7030

RECORD # 114
7200 REM OPEN FILE F
7130 REM **********

RECORD # 115
7210 ON ERROR GOTO 7300
7200 REM OPEN FILE F

RECORD # 116
7220 OPEN OLD F$(F) AS F
7210 ON ERROR GOTO 7300

RECORD # 117
7230 ON ERROR GOTO 0
7220 OPEN OLD F$(F) AS F

RECORD # 118
7240 IF S(F)>0 THEN D=1
7230 ON ERROR GOTO 0

RECORD # 119
7250 RETURN
7240 IF S(F)>0 THEN D=1

RECORD # 120
7300 REM error handler
7250 RETURN

RECORD # 121
7310 RESUME 7230
7300 REM error handler

RECORD # 122
7320 REM **********
7310 RESUME 7230
PREMATURE EOF ON FILE 1.CMP-3.BAS
 122 RECORDS PROCESSED
 14 COMPARE ERRORS


READY

RUN

ENTER FIRST FILE NAME? 1.CMP-3.BAS
ENTER SECOND FILE NAME? WRONG
STATUS ERROR  4  ON FILE WRONG
 0 RECORDS PROCESSED
NO COMPARE ERRORS


READY
```


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DISPLAY statistics
Gather and display information about your cellar.

PRINT inventory
Create a hard copy of your cellar's contents and value.

WINE CELLAR is an inventory program for wine buffs. It allows enthusiasts to manage certain information about their wine and manipulate this information from day to day. Up to 400+ unique wine types can be kept on the program diskette alone with 800 additional types on a second disc. Each type can contain up to 2700 cases in the inventory. Graphics are used to provide information about a wine's availability, rating and drinkability. Wild card searches of the cellar provide snapshots of inventory while any particular entry can be looked at in detail. Statistics of the cellar can be displayed and inventories printed.

Price $49.95
Cal residents add $3
WE Software
800 Greenwich Dr
Chico, CA 95926

*Apple is a registered trademark of Apple Computer Inc.

CIRCLE 218 ON READER SERVICE CARD

The story behind the two best selling computer games books in the world.

Computer Games

by David H. Ahl

Everybody likes games. Children like tic tac toe. Gamblers like blackjack. Trekkies like Star Trek. Almost everyone has a favorite game or two.

It Started in 1971

Ten years ago when I was at Digital Equipment Corp. (DEC), we wanted a painless way to show reluctant educators that computers weren't scary or difficult to use. Games and simulations seemed like a good method.

So I put out a call to all our customers to send us their best computer games. The response was overwhelming. I got 21 versions of blackjack, 15 of nim and 12 of battleship.

From this enormous outpouring I selected the 90 best games and added 11 that I had written myself for a total of 101. I edited these into a book called 101 Basic Computer Games which was published by DEC. It still is.

When I left DEC in 1974 I asked for the rights to print the book independently. They agreed as long as the name was changed.

Contents of *Basic Computer Games* (right) and *More Basic Computer Games* (below).

Introduction
The Basic Language
Conversion to Other Basics
Acey Ducey
Amazing
Animal
Awari
Bagels
Banner
Basketball
Batnum
Battle
Blackjack
Bombardment
Bombs Away
Bounce
Bowling
Boxing
Bug
Bullfight
Bullseye
Bunny
Buzzword
Calendar
Change
Checkers
Chemist
Chief
Chomp
Civil War
Combat
Craps
Cube
Depth Charge
Diamond
Dice
Digits
Even Wins
Flip Flop
Football
Fur Trader
Golf
Gomoko
Guess
Gunner
Hammurabi
Hangman
Hello
Hexapawn
Hi-Lo
High I-Q
Hockey
Horserace
Hurkle
Kinema
King
Letter
Life
Life For Two
Literature Quiz
Love
Lunar LEM Rocket
Master Mind
Math Dice
Mugwump
Name
Nicomachus
Nim
Number
One Check
Orbit
Pizza
Poetry
Poker
Queen
Reverse
Rock, Scissors, Paper
Roulette
Russian Roulette
Salvo
Sine Wave
Slalom
Slots
Splat
Stars
Stock Market
Super Star Trek
Synonym
Target
3-D Plot
3-D Tic-Tac-Toe
Tic Tac toe
Tower
Train
Trap
23 Matches
War
Weekday
Word

Artillery-3
Baccarat
Bible Quiz
Big 6
Binary
Blackbox
Bobstones
Bocce
Boga II
Bumbrun
Bridge-It
Camel
Chase
Chuck-A-Luck
Close Encounters
Column
Concentration
Condot
Convoy
Corral
Countdown
Cup
Dealer's Choice
Deepspace
Defuse
Dodgem
Doors
Drag
Dr. Z
Eliza
Father
Flip
Four In A Row
Geowar
Grand Prix
Guess-It
ICBM
Inkblot
Joust
Jumping Balls
Keno
L Game
Life Expectancy
Lissajous
Magic Square
Man-Eating Rabbit
Maneuvers
Mastermind
Masterbagels
Matpuzzle
Maze
Millionaire
Minotaur
Motorcycle Jump
Nomad
Not One
Obstacle
Octrix
Pasart
Pasart 2
Pinball
Rabbit Chase
Roadrace
Rotate
Safe
Scales
Schmoo
Seabattle
Seawar
Shoot
Smash
Strike 9
Tennis
Tickertape
TV Plot
Twonky
Two-to-Ten
UFO
Under & Over
Van Gam
Warfish
Word Search Puzzle
Wumpus 1
Wumpus 2

Converted to Microsoft Basic

The games in the original book were in many different dialects of Basic. So Steve North and I converted all the games to standard Microsoft Basic, expanded the descriptions and published the book under the new name Basic Computer Games.

Over the next three years, people sent in improved versions of many of the games along with scores of new ones. So in 1979, we totally revised and corrected Basic Computer Games and published a completely new companion volume of 84 additional games called More Basic Computer Games. This edition is available in both Microsoft Basic and TRS-80 Basic for owners of the TRS-80 computer.

Today Basic Computer Games is in its fifth printing and More Basic Computer Games is in its second. Combined sales are over one half million copies making them the best selling pair of books in recreational computing by a wide margin. There are many imitators, but all offer a fraction of the number of games and cost far more.

The games in these books include classic board games like checkers. They include challenging simulation games like Camel (get across the desert on your camel) and Super Star Trek. There are number games like Guess My Number, Stars and Battle of Numbers. You'll find gambling games like blackjack, keno, and poker. All told there are 185 different games in these two books.

Whether you're just getting started with computers or a proficient programmer, you'll find something of interest. You'll find 15-line games and 400-line games and everything in between.

The value offered by these books is outstanding. Every other publisher has raised the price of their books yet these sell for the same price as they did in 1974.

Moneyback Guarantee

Examine one or both of these books and key some games into your computer. If you're not completely satisfied we'll refund the full purchase price plus your return postage.

Basic Computer Games and More Basic Computer Games are $7.95 each. More Basic Computer Games only is available for Microsoft and TRS-80 editions (please specify your choice.) If you purchase both books the price if only $15.00. Send payment* plus $3.00 postage and handling to Creative Computing, Dept. C0520, One Park Avenue, Room 458, New York, N.Y. 10016. Orders may also be charged to your Visa, MasterCard or American Express account—by mail include credit card name, number and expiration date, or if you prefer, use our 24 hour toll-free number, 800-631-8112. In NJ only 201-540-0445.

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The final test was with a wrong file name. The error message produced was correct, error 4 is the FLEX error number for FILE NOT FOUND. Listing 6 shows the final version of the program. There are very few changes from the original. Of course you can't make a lot of changes in less than one hour of debugging.

I have very favorable conclusions. First, the time I spent developing the working program was much less than my estimate and, in fact, less than my estimate for doing it the "quick and dirty" way. The resulting program is very readable, and I have some accurate documentation on its operation. In other words, structured design for Basic programs works great! □

Listing 6. Listing of CMP-4.

```
  1 REM FILE COMPARE 1-24-80
  5 REM VARIABLE USAGE
 10 REM F=Current file number
 20 REM S(1),S(2)=File status
 30 REM B$(1),B$(2)=Record buffers
 40 REM F$(1),F$(2)=File names
 50 REM D=Done flag (1=TRUE)
 60 REM R=Record number
 70 REM E=Number of record compare errors
 80 REM **********
 85 DIM S(2),B$(2),F$(2)
 90 EF=8 :REM EOF Status
 95 REM **********
100 REM MAIN PROGRAM
110 GOSUB 500 : REM Setup
120 REM Process records (0,n)
130 IF D=0 THEN GOSUB 1000 ELSE 150
140 GOTO 120
150 GOSUB 1500 : REM Cleanup
160 END
170 REM **********
500 REM SETUP
510 S(1)=-1
520 S(2)=-1
530 GOSUB 2100:REM Get parameters
540 GOSUB 2200 : REM Open file 1
550 GOSUB 2300 : REM Open file 2
560 IF D=0 THEN GOSUB 2400 : REM Read first records
570 RETURN
580 REM **********
1000 REM PROCESS RECORDS
1010 R=R+1
1015 REM Compare
1020 IF B$(1)<>B$(2) THEN GOSUB 2000
1030 REM Read next records
1040 F=1
1050 GOSUB 7000
1060 F=2
1070 GOSUB 7000
1080 RETURN
1090 REM **********
1500 REM CLEANUP
1510 IF (S(1)=EF) AND (S(2)<>EF) THEN GOSUB 3000
1515 IF (S(2)=EF) AND (S(1)<>EF) THEN GOSUB 3000
1520 F=1:GOSUB 3200
1530 F=2:GOSUB 3200
1540 GOSUB 3500 : REM Statistics
1550 RETURN
1560 REM **********
2000 REM RECORDS NOT EQUAL
2010 E=E+1
2020 PRINT:PRINT "RECORD #";R
2030 PRINT B$(1)
2040 PRINT B$(2)
2050 RETURN
2060 REM **********
2100 REM GET PARAMETERS
2110 INPUT "ENTER FIRST FILE NAME",F$(1)
2120 INPUT "ENTER SECOND FILE NAME",F$(2)
2130 D=0
2140 RETURN
2150 REM **********
2200 REM OPEN FILE 1
2210 IF D=0 THEN 2220 ELSE 2240
2220 F=1
2230 GOSUB 7200
2240 RETURN
2250 REM **********
2300 REM OPEN FILE 2
2310 IF D=0 THEN 2320 ELSE 2340
2320 F=2
2330 GOSUB 7200
2340 RETURN
2350 REM **********
2400 REM READ FIRST RECORDS
2410 F=1
2420 GOSUB 7000
2430 F=2
2440 GOSUB 7000
2450 RETURN
2460 REM **********
3000 REM PREMATURE EOF ERROR
3010 PRINT "PREMATURE EOF ON FILE ";
3020 IF S1=EF THEN PRINT F$(2) ELSE PRINT F$(1)
3030 RETURN
3040 REM **********
3200 REM FILE CLEANUP
3210 IF (S(F)>0)AND(S(F)<>EF) THEN 3220 ELSE 3230
3220 PRINT "STATUS ERROR ";S(F);" ON FILE ";F$(F)
3230 IF S(F)>=0 THEN 3240 ELSE 3270
3240 ON ERROR GOTO 3300
3250 CLOSE F
3260 ON ERROR GOTO 0
3270 RETURN
3300 REM error handler
3310 PRINT "CLOSE ERROR ON ";F$(F)
3320 RESUME 3260
3330 REM **********
3500 REM STATISTICS
3510 PRINT R;"RECORDS PROCESSED"
3520 IF E>0 THEN PRINT E;"COMPARE ERRORS"
3530 IF E=0 THEN PRINT "NO COMPARE ERRORS"
3540 RETURN
3550 REM **********
7000 REM READ RECORD FROM FILE F
7010 ON ERROR GOTO 7100
7020 INPUT #F,B$(F)
7030 ON ERROR GOTO 0
7040 RETURN
7100 REM error handler
7110 S(F)=ERR
7115 D=1
7120 RESUME 7030
7130 REM **********
7200 REM OPEN FILE F
7210 ON ERROR GOTO 7300
7220 OPEN OLD F$(F) AS F
7230 ON ERROR GOTO 0
7240 IF S(F)>0 THEN D=1
7250 RETURN
7300 REM error handler
7310 RESUME 7230
7320 REM **********

READY
```

SD Systems ExpandoRAM III

256K RAM $879.95

Single User System

SBC-200, 64K ExpandoRAM II, Versafloppy II, CP/M 2.2

$1095.00

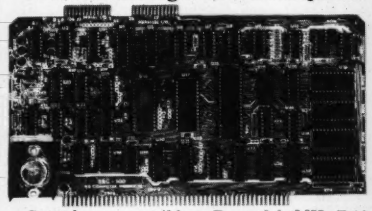
4 MHz Z-80A CPU, 64K RAM, serial I/O port, parallel I/O port, double-density disk controller, CP/M 2.2 disk and manuals, system monitor, control and diagnostic software.

Add $100.00 for upgrade to ExpandoRAM III 64K (expandable to 256K)

-All boards are assembled and tested-

SBC-200

2 or 4 MHz single board computer



• S-100 bus compatible • Powerful 4MHz Z-80A CPU • Synchronous/asynchronous serial I/O port with RS-232 interface and software programmable baud rates up to 9600 baud • Parallel input and parallel output port • Four channel counter/timer • Four maskable, vectored interrupt inputs and a non-maskable interrupt • 1K of on-board RAM • Up to 32K of on-board ROM • System monitor PROM included

The SBC-200 is an excellent CPU board to base a microcomputer system around. With on-board RAM, ROM, and I/O, the SBC-200 allows you to build a powerful three-board system that has the same features found in most five-board microcomputers. The SBC-200 is compatible with both single-user and multi-user systems.

CPU-30200A *A & T with monitor* **$299.95**

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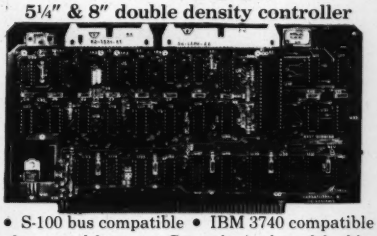
5¼" & 8" double density controller



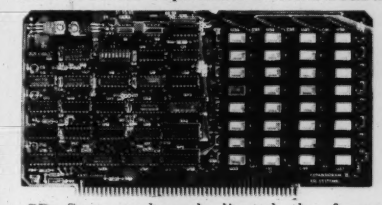
• S-100 bus compatible • IBM 3740 compatible soft sectored format • Controls single and double-sided drives, single or double density, 5¼" and 8" drives in any combination of four simultaneously • Drive select and side select circuitry • Analog phase-locked loop data seperator • Vectored interrupt operation optional • Standard CP/M 2.2 disk operating • Control/diagnostic software PROM included

The Versafloppy II is faster, more stable and more tolerant of bit shift and "jitter" than most controllers. All control and diagnostic software included.

IOD-1160A *A & T* **$359.95**
For CP/M 2.2 and manual set add **$99.95**

ExpandoRAM III

64K to 256K expandable RAM board



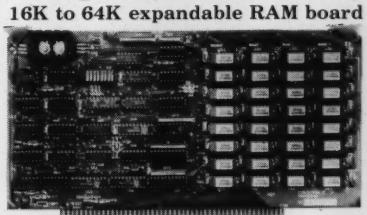
SD Systems has duplicated the famous reliability of their ExpandoRAM I and II boards in the new ExpandoRAM III, a board capable of containing 256K of high speed RAM. Utilizing the new 64K x 1 dymanic RAM chips, you can configure a memory of 64K, 128K, 192K, or 256K, all on one S-100 board. Memory address decoding is done by a programmed bipolar ROM so that the memory map may be dip-switch configured to work with either COSMOS/MPM-type systems or with OASIS-type systems.

Extensive application notes concerning how to operate the ExpandoRAM III with Cromemco, Intersystems, and other popular 4 MHz Z-80 systems are contained in the manual.

MEM-65064A *64K A & T* **$495.00**
MEM-65128A *128K A & T* **$639.95**
MEM-65192A *192K A & T* **$769.95**
MEM-65256A *256K A & T* **$879.95**

ExpandoRAM II

16K to 64K expandable RAM board



• S-100 bus compatible • Up to 4MHz operation • Expandable from 16K to 64K • Uses 16 x 1 4116 memory chips • Page mode operation allows up to 8 memory boards on the bus • Phantom output disable • Invisible on-board refresh

The ExpandoRAM II is compatible with most S-100 CPUs. When other SD System' series II boards are combined with the ExpandoRAM II, they create a microcomputer system with exceptional capabilities and features.

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MEM-32631A *32K A & T* **$365.00**
MEM-48632A *48K A & T* **$385.00**
MEM-64633A *64K A & T* **$399.95**

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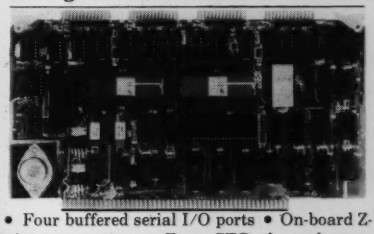
Two Z-80A CPUs (4 MHz), 256K RAM, 5 serial I/O ports with independently programmable baud rates and vectored interrupts, parallel input port, parallel output port, 8 counter/timer channels, real time clock, single and double sided/single or double density disk controller for 5¼" and 8" drives, up to 36K of on-board ROM, CP/M 2.2 compatible COSMOS interrupt driven multi-user disk operating system, allows up to 8 users to run independent jobs concurrently, C BASIC II, control and diagnostic software in PROM included.

-All boards are assembled and tested-

MPC-4

Intelligent communications interface



• Four buffered serial I/O ports • On-board Z-80A processor • Four CTC channels • Independently programmable baud rates • Vectored interrupt capability • Up to 4K of on-board PROM • Up to 2K of on-board RAM • On-board firmware

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IOI-2050A *Par & Ser A & T* **$169.95**
IOI-2052K *Serial kit* **$89.95**
IOI-2052A *Serial A & T* **$99.95**
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TELEVIDEO 950

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Detachable keyboard, serial RS232C interface, baud rates from 110 to 19,200, auxiliary serial output port, 24 x 80 display.

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DIALOGUE 80 - Ampex

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CPU-30201A *A & T* **$189.95**
CPU-30200B *Bare board* **$35.00**

2810 Z-80* CPU - Cal Comp Sys

2/4 MHz Z-80A CPU with RS-232C serial I/O port and on board MOSS 2.2 monitor PROM, front panel compatible*

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16K or 32K uses 2708's or 2716's, 1K boundary

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64 characters x 16 lines, 128 x 48 matrix for graphics, full upper/lower case ASCII character set, numbers, symbols, and greek letters, normal/reverse/blinking video, S-100.

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64K static S-100 RAM card, 4-16K banks, up to 8MHz

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IOI-1046A *A & T* **$299.95**
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I/O-4 - S.S.M.

2 serial I/O ports plus 2 parallel I/O ports

IOI-1010K *Kit* **$179.95**
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IOI-1010B *Bare board* **$35.00**

S-100 Mainframes

MAINFRAME - Cal Comp Sys

12 slot S-100 mainframe with 20 amp power supply

ENC-112105 *Kit* **$329.95**
ENC-112106 *A & T* **$399.95**

EPROM ERASER - Spectronics

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XME-3100A *With out timer* **$69.50**
XME-3101 *With timer* **$94.50**
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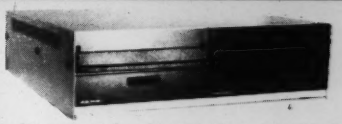
CIRCLE 199 ON READER SERVICE CARD

Disk Drives



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8" Disk Drive Subsystems
Single Sided, Double Density

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END-000424 *A & T w/2 FD100-8Ds* **$1124.95**
END-000433 *Kit w/2 SA-801Rs* ... **$999.95**
END-000434 *A & T w/2 SA-801Rs* **$1195.00**

8" Disk Drive Subsystems
Double Sided, Double Density

END-000426 *Kit w/2 DT-8s* **$1224.95**
END-000427 *A & T w/2 DT-8s* ... **$1424.95**
END-000436 *Kit w/2 SA-851Rs* .. **$1295.00**
END-000437 *A & T w/2 SA-851Rs* **$1495.00**

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MSM-104500 .. $349.95 ea 2 for **$329.95 ea**

Qume DT-5 *dbl-sided dbl-density 80 track*
MSM-750050 .. $359.95 ea 2 for **$349.95 ea**

MPI B-51 *sngl-sided dbl-density 40 track*
MSM-155100 .. $234.95 ea 2 for **$224.95 ea**

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MSM-155300 .. $369.95 ea 2 for **$359.95 ea**

MPI B-92 *dbl-sided dbl-density 77 track*
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MSF-10801R .. $394.95 ea 2 for **$389.95 ea**

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MSF-10851R .. $554.95 ea 2 for **$529.95 ea**

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S-100 diagnostic analyzer board, dynamic visual display of all 96 IEEE S-100 signals, aids in real time analysis of faulty hardware and software

TSX-200B *Bare Board* **$59.95**
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TSX-200A *A & T* **$149.95**

Listing/Copying Apple Text Files

Jack P. Ott

One of the minor annoyances in using text files on the Apple II with DOS 3.2 is the inability to get a printout of the file as easily as one can by loading and listing a Basic program.

Another nuisance is the fact that there is no simple command sequence to load and save duplicates of the text file on different drives or under different names on the same drive. The only way to accomplish this is to write a complete program to do these tasks.

In practice, most well-designed programs that use text files should incorporate these features as options somewhere in the program. However, the results are generally specific to the files created by the original program and must match the format used (type and number of variables per record, etc.) and/or be included on a possible menu of available files. This does not help the user who is writing a program and needs the listing and copying options, to help detect and debug errors. Most text editors can help here, but not everyone, especially those just learning about Apple text files, can justify their expense.

With these difficulties in mind, this article presents a program that permits the listing and copying of any text file, and allows simple editing of whole records. You can delete or insert a complete record, or change a record by retyping the new entry.

If you wish, a backup file can be made before any editing is done. This program is not as versatile as a true text editor since it is not screen-oriented and you cannot change just one letter or word. However, it is much simpler to use.

While not necessarily efficient, this program does have the ability to create a new text file. The REM statements in the program give details on how to do this.

Programming Style

The program was written with clarity as its first objective, not effficiency. It squanders memory space recklessly by using many REM statements and avoiding subroutines. No POKEs, PEEKs or CALLs were used if an equivalent Applesoft line would do. Despite a goal of comprehensibility, the listing wanders around a bit as Basic programs tend to do. This is not excessive, and with the REM statements most programmers should be able to follow it.

The program is well documented. The REM statements should be read because they explain all the details of how the code works, the potential problems that might be encountered and the limitations that exist.

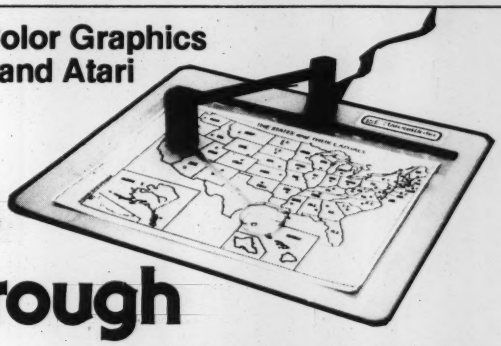
Some readers, after reading the listing here, might prefer to omit the REM statements. The only problem is that nine of the GOTO statements are keyed to REM line numbers. I prefer it this way since it helps people who are trying to follow the code. For me it does not slow execution discernibly, and my Apple has enough memory. The changes are listed in Table 1. □

Table 1. Listing/Copying Apple II Text Files.

Program Line Number	Calls for GOTO	Change To
2500	3370	3620
2670	6370	6440
2680	2720	3030
3280	3310	3350 (3345 if printer used)
3800	3890	3950
4240	5290	5340
4270	4350	4470
6060	6320	6360
6550	6580	6575 (only if printer used)
6670	6930	6970

Jack P. Ott, 250 West 94th St., New York, NY 10025.

High-Resolution Color Graphics for the Apple and Atari



Graphics Breakthrough

How many programs have you written that would benefit from animated high-resolution graphics? Probably several. It is this kind of dramatic graphics that distinguish outstanding programs from ordinary ones. But if you've ever agonized for hours or days just to get one image perfected, you're probably not anxious to do it again. Now there's a better way.

New Graphics Entry System

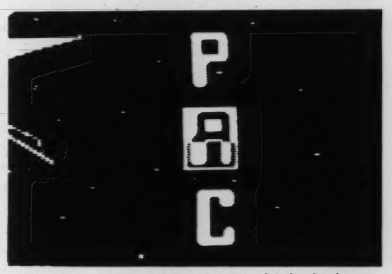
Today there is a new graphics system available that is not only amazingly user-oriented but surprisingly economical. Called VersaWriter, it starts with an ingeniously simple entry board consisting of a 14" X 12" high impact plastic bed with a tough clear plastic overlay sheet. The original drawing or diagram is fastened with masking tape to the plastic bed and then covered with the clear sheet. Instead of using a light pen or complicated electronic X-Y head, the VersaWriter uses a double jointed arm attached to the top of the entry board at one end and a magnifying lens with crosshairs at the other end. The VersaWriter resembles a draftsman's pantograph on a smaller scale.

At each joint in the arm of the VersaWriter is a potentiometer. A cable from these pontentiometers connects to the paddle input of the computer. No special interface electronics or board is needed. Since the arm of the VersaWriter bends only in one direction, each point on the plotting head corresponds to a unique set of resistances on the potentiometers. All that's needed now is software to translate these resistances into usable screen coordinates.

Exceptionally powerful software

It is in the software where VersaWriter really stands out. VersaWriter comes with two full disks of user-oriented software. First it has sets of "low level" commands for entering, creating and copying drawings and diagrams. Secondly, it has extensive sets of application routines for moving, enlarging, rotating, coloring or animating drawings that the user has created.

Of course the basic commands let you enter a drawing freehand or by tracing it. Want a wider brush stroke? Six widths are available. Drawings can be independently scaled in both the vertical and horizontal directions. An enclosed shape may be filled in with any of 106 colors. No, that is not a misprint—By the same technique that a printing press can create hundreds of colors from the three primary ones, so can VersaWriter.



Here a shape (the letter A) is being scanned. After putting it in a shape table it may be used in other programs.

From the shape table, a shape (the letter A) may be enlarged, rotated, colored or moved about the screen.

Create Animation for Other Programs

The shapes you create with VersaWriter can be used and manipulated with ease in other programs. Up to 255 shapes can be entered into a shape table. These shapes may then be placed on the screen in any position or may be overlaid on a full or partial screen image. Animation is produced easily by moving about a portion of the image created by VersaWriter. For example, by alternating between two images of an airplane propeller it will appear to be spinning.

Other VersaWriter software includes text-writer with which text can be added to graphics. Upper and lower case, choice of color, text size, direction and starting point all may be specified.

The Area/Distance program lets you calculate distances (or perimeters) by entering a scale and tracing a shape or map route with the drawing arm. Areas of figures, open and irregular, can be similarly calculated.

The software also includes sets of electronic and computer logic shapes. In addition, an entire disk of dramatic demonstration graphics is included. These twelve full-screen graphics run the gamut from a fully labeled cross section of a human skull to colored maps to animated cartoons to an electronics schematic.

Software Updates

You may have read a review of VersaWriter that indicated that the color fill routine was slow. It was. But not any more. Several routines and improvements were added to the VersaWriter software since its introduction. An added feature, the Expansion Pac, is also now available. This third disk of software contains an area distance program, a microscope feature, and will save your graphics in the exact colors you prefer. It also includes shape tables for architecture, plumbing, electrical, circuit boards, landscape, chemistry, games, and more; 350 predefined shapes in all.

At Peripherals Plus, we evaluated every graphics device. We wanted to handle the best one regardless of price. VersaWriter has the best performance bar none. Surprisingly, it also has the lowest price, just $299.00 for the Apple version. It requires an Apple II Applesoft in Rom (or an Apple II Plus), disk, and 48K memory. VersaWriter comes complete with two disks of software, a comprehensive instruction manual, and a 90-day limited warranty. The additional Expansion Pac is available for $39.95.

The Atari version, which varies slightly from the Apple version in number and types of functions performed, is available for $299.00. As new updates are developed for the Atari, Peripherals Plus will furnish them free to all customers—just send us the disk and we'll supply the updated material. We make this unique offer because it is in our best interest to have you make the best use of your computer. We're also convinced that if other people see your VersaWriter in use they'll want one too.

Try VersaWriter for 30 days. If you are not completely satisfied we'll give you a prompt and courteous refund of the full price plus shipping both ways.

To order, specify Apple or Atari version. Send payment* indicated plus $3.00 postage and handling to Creative Computing, Dept. C0523, One Park Avenue, New York, N.Y. 10016. Orders may also be charged to your Visa, MasterCard or American Express account—by mail include credit card name, number and expiration date, or if you prefer, use our 24 hour toll-free number, 800-631-8112. In NJ only 201-540-0445.

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Houston Instruments Hi Pad	**795.00**
Apple Graphics Tablet	**795.00**

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☆ (Back issues available on request)

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3. Tax Deduction Flags
4. Net Worth Statement
5. Income Less Expense Statement
6. Complete Graph Package (graphs any files)
7. Payments and Appointments Calendar
8. Home Budget Analysis
9. Mailing List

All programs are menu-driven and allow add/change/delete. Also, all files and statements can be listed to screen or printer, and saved to cassette or diskette. The cost of THE COLOR ACCOUNTANT is $75 for cassette and $80 for diskette. This package requires 16K for the TRS-80 COLOR, Model I, III, and Apple II+. However the ATARI 400/800 requires 24K for cassette and 32K for diskette. THE COLOR ACCOUNTANT also comes with 40 pages of documentation.

the programmer's program

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*All software available on cassette for ATARI 400/800, APPLE II+, MODEL I, III, COLOR. On Diskette for the APPLE II+, MODEL III, ATARI 400/800.

CIRCLE 207 ON READER SERVICE CARD

Text Files, continued...

```
2000  REM
2010  REM  THIS PROGRAM IS WRITTEN IN APPLESOFT USING DOS 3.2
2020  REM  IT CAN FIT INTO A 24K MACHINE IF MANY OF THE REMS
2030  REM  ARE DELETED SINCE HGR IS NOT USED SO THAT
2040  REM  SECTION OF MEMORY CAN BE OVERWRITTEN
2050  REM
2060  REM  AUTHOR: JACK P. OTT
2070  REM
2080  REM  WEST HEMPSTEAD HIGH SCHOOL
2090  REM
2100  REM  THIS VERSION OF THE PROGRAM IS FORMATTED SO THAT
2110  REM  THE ALIGNMENT IS APPROPRIATE FOR LISTING ON A PRINTER
2120  REM
2130  REM  THIS PROGRAM READS A TEXT FILE AND PRINTS OUT
2140  REM  THE CONTENTS ON THE CRT
2150  REM
2160  REM  IF YOU WISH THE FILE LISTINGS TO BE DONE ON YOUR PRINTER
2170  REM  YOU WOULD HAVE TO ADD THE LINES GIVEN AT THE END OF
2180  REM  THE PROGRAM. THEY ASSUME YOU ARE USING A CARD IN SLOT 1
2190  REM  TO INTERFACE YOUR PRINTER TO THE APPLE
2200  REM
2210  REM
2220  REM  IT THEN PERMITS SIMPLE EDITING ON THIS FILE
2230  REM  YOU CAN EITHER INSERT, DELETE OR CHANGE WHOLE RECORDS
2240  REM  YOU MUST REMEMBER THE POSITION OF THE RECORD THAT
2250  REM  YOU WANT TO CHANGE
2260  REM
2270  REM  YOU CAN USE CONTROL S TO STOP PRINTING
2280  REM  WHILE YOU CHECK RECORDS
2290  REM  OR NOTE POSITION NUMBERS AND CHANGES YOU WANT TO MAKE
2300  REM
2310  REM  IT ALSO ALLOWS YOU TO SAVE A COPY OF THE TEXT FILE
2320  REM  ON EITHER DISK DRIVE
2330  REM
2340  REM  A DEFAULT MODE IS AVAILABLE IN THIS COPYING ROUTINE
2350  REM  TO USE IT JUST HIT RETURN WHEN ASKED FOR THE COPY'S FILE NAME
2360  REM  THE DEFAULT MODE USES THE SAME FILE NAME
2370  REM  AND OPPOSITE DRIVE NUMBER
2380  REM
2390  REM  WHEN YOU BEGIN USING THE PROGRAM
2400  REM  YOU MUST SPECIFY THE FILE NAME, THE TYPE, I.E.,
2410  REM  (SEQUENTIAL OR RANDOM)
2420  REM  THE LENGTH IF RANDOM, AND THE DRIVE NUMBER
2430  REM
2440  HOME : PRINT : PRINT
2450  REM
2460  REM  THE ONERR TRAP IS USED TO PREVENT PREMATURE TERMINATION
2470  REM  OF THE PROGRAM WHEN SPECIFIC ERRORS OCCUR
2480  REM  DETAILS ARE GIVEN IN THAT PART OF THE PROGRAM
2490  REM
2500  ONERR  GOTO 3370
2510  REM
2520  REM  A$(J) HOLDS THE TEXT FILE AS IT IS READ
2530  REM
2540  REM  A$(J) IS DIMENSIONED AS 200
2550  REM  BUT COULD BE CHANGED FOR A LONG TEXT FILE
2560  REM  JUST CHANGE THE VALUE OF MAXLNG TO DO THIS
2570  REM
2580  LET MAXLNG = 200
2590  DIM A$(MAXLNG)
2600  REM
2610  REM  CHR$(13) IS A CARRIAGE RETURN
2620  REM
2630  LET R$ =  CHR$ (13)
2640  LET D$ =  CHR$ (4)
2650  PRINT D$;"NOMON C,I,O"
2660  INPUT "RANDOM OR SEQUENTIAL-TYPE R OR S :";T$
2670  IF T$ = "S" THEN  PRINT : GOTO 6370
2680  IF T$ = "R" THEN  PRINT : GOTO 2720
2690  PRINT : FLASH : PRINT "JUST R OR S, PLEASE"
2700  FOR HH = 1 TO 2000: NEXT HH
2710  NORMAL : HOME : PRINT : PRINT : GOTO 2660
2720  REM
2730  REM  IF YOU NAME AN EXISTING FILE AND ITS CORRECT LENGTH
2740  REM  THE PROGRAM WORKS WELL
2750  REM
2760  REM  IF YOU GIVE A NON-EXISTING FILE NAME, THE PROGRAM
2770  REM  CREATES AN EMPTY FILE WITH THAT NAME
2780  REM  THIS FEATURE CAN BE USED TO CREATE TEXT FILES
2790  REM
2800  REM  TO HAVE THIS PROGRAM CREATE FILES
2810  REM  JUST NAME YOUR FILE AND USE THE INSERT MODE TO ENTER IT
2820  REM  YOU MUST BEGIN WITH RECORD 0 AND PROCEED CONSECUTIVELY
2830  REM
2840  REM  A WRONG LENGTH GIVES UNRELIABLE AND/OR WEIRD RESULTS
```

Whatever your record keeping needs, Data Factory will help you.

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The new version of Data Factory is COMPLETELY ADAPTABLE. It includes a customized data entry system that allows you to position information anywhere on the screen. The flexible print-out routine frees you from formatting constraints giving you pin point control.

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THE DATA FACTORY T.M.

CIRCLE 188 ON READER SERVICE CARD

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```
2850  REM
2860  REM  IF YOU DON'T KNOW THE RANDOM TEXT FILE'S LENGTH,
2870  REM  YOU HAVE TO TRY DIFFERENT VALUES
2880  REM  UNTIL THE RESULTS LOOK RIGHT
2890  REM
2900  REM  IF THE RANDOM TEXT FILE HAS UNUSED RECORDS THE OUT OF DATA
2910  REM  ERROR WILL OCCUR AND YOU WILL ONLY SEE THE PART OF THE
2920  REM  FILE THAT PRECEDES THIS GAP
2930  REM  THIS IS A REAL PROBLEM IF RECORD 0 IS UNUSED
2940  REM  DOCTORING THE VALUE OF R IN LINE 3250 CAN HELP COMPENSATE
2950  REM  FOR THIS BUT THIS CAUSES OTHER PROBLEMS IF EDITING OR COPYING
2960  REM  IS DONE BECAUSE AN UNUSED RECORD AND A BLANK RECORD
2970  REM  CONTAINING JUST A CARRIAGE RETURN ARE NOT THE SAME
2980  REM
2990  REM  THE PROGRAM LINES NECESSARY TO HANDLE THIS KIND OF
3000  REM  RANDOM TEXT FILE ARE GIVEN IN REM STATEMENTS
3010  REM  AT THE END OF THE PROGRAM LISTING
3020  REM
3030  PRINT "WHAT IS THE NAME OF THE TEXT FILE YOU"
3040  INPUT "WISH TO LOOK AT ? ";N$
3050  PRINT
3060  INPUT "LENGTH OF RECORD ? ";L
3070  PRINT
3080  INPUT "DISK DRIVE ? ";D
3090  PRINT D$;"OPEN"N$",L"L",D"D
3100  REM
3110  REM  USING A GET STATEMENT THE APPLE READS
3120  REM  A CHARACTER AT A TIME UNTIL IT HITS
3130  REM  A CARRIAGE RETURN
3140  REM
3150  REM  IT CONCATENATES EACH ENTRY UNTIL THE CR IS ENCOUNTERED
3160  REM
3170  REM  THIS IS CONSIDERED A RECORD AND IS PRINTED
3180  REM
3190  REM  THIS IS BASICALLY THE SCHEME DESCRIBED
3200  REM  IN THE DOS MANUAL
3210  REM
3220  HOME : PRINT : PRINT : PRINT
3230  PRINT "FILE CONTENTS ARE:": PRINT : PRINT
3240  FOR J = 0 TO MAXLNG
3250  PRINT D$;"READ"N$",R"J
3260  LET A$(J) = ""
3270  GET B$
3280  IF B$ = R$ THEN  GOTO 3310
3290  LET A$(J) = A$(J) + B$
3300  GOTO 3270
3310  REM
3320  REM  SINCE THE FIRST CHARACTER AFTER A DOS GET IS NOT
3330  REM  PRINTED, CHR$(6) IS USED AS A THROWAWAY PRINT ELEMENT
3340  REM
3350  PRINT  CHR$ (6);J")";: HTAB 6: PRINT A$(J)
3360  NEXT J
3370  REM
3380  REM  THE ONERR TRAP IS USED TO SCREEN OUT SEVERAL PROBLEMS
3390  REM  WHEN AN ERROR OCCURS THE CODE IS STORED IN CELL 222
3400  REM  BY CHECKING FOR SPECIFIC ERRORS AND PROVIDING APPROPRIATE
3410  REM  ACTIONS IN EACH CASE, WE PREVENT PREMATURE TERMINATION
3420  REM
3430  REM  AN ERROR CODE OF 5 MEANS THE FILE RAN OUT OF DATA
3440  REM  WHICH OCCURS BECAUSE NO LENGTH IS SPECIFIED AT THE BEGINNING
3450  REM  THE FILE IS CLOSED AND THE PROGRAM GOES TO THE EDITING PHASE
3460  REM
3470  REM  SINCE THE MACHINE TRIED TO READ BEYOND THE END
3480  REM  OF A FILE GETTING OUT OF DATA IN THE 'J' LOOP
3490  REM  THE LENGTH OF THE FILE IS FROM 0 TO J-1
3500  REM
3510  REM  A CODE OF 6 MEANS YOU TRIED TO DELETE A FILE THAT DID NOT
3520  REM  EXIST DURING THE COPYING PHASE OF THE PROGRAM
3530  REM  THE MACHINE SIMPLY GOES BACK TO THE NEXT STEP
3540  REM
3550  REM  A CODE OF 254 MEANS YOU MISTYPED THE INPUT
3560  REM  FOR EXAMPLE, 'YES' WHEN A NUMBER IS REQUIRED
3570  REM  AFTER A MESSAGE YOU SIMPLY GO BACK TO THE SAME SPOT
3580  REM
3590  REM  FOR OTHER, UNANTICIPATED, ERRORS THE CODE IS PRINTED
3600  REM  AND EXECUTION HALTED
3610  REM
3620  LET Y =  PEEK (222)
3630  IF Y = 5 THEN  PRINT D$;"CLOSE"N$
3640  IF Y = 5 THEN  GOTO 3710
3650  IF Y = 6 AND T$ = "R" THEN  GOTO 6250
3660  IF Y = 6 AND T$ = "S" THEN  GOTO 6860
3670  IF Y = 254 THEN  PRINT "INPUT IN INCORRECT FORM"
3680  IF Y = 254 THEN  RESUME
3690  PRINT "ONERR CODE IS "Y
```

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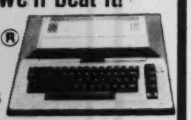

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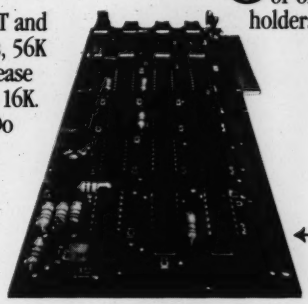

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Text Files, continued...

```
3700  STOP
3710  PRINT : PRINT : PRINT
3720  REM
3730  REM  A FLAG IS USED TO SEE IF ANY CHANGES
3740  REM  HAVE BEEN MADE IN THE ORIGINAL FILE
3750  REM  IF SO IT WILL BE REWRITTEN
3760  REM
3770  LET CHANGEFLAG = 0
3780  PRINT "DO YOU WISH TO MAKE ANY CHANGES IN"
3790  INPUT "THIS FILE (YES, NO, LIST) ? ";Q$
3800  IF Q$ = "YES" AND CHANGEFLAG = 0 THEN  GOTO 3890
3810  REM
3820  REM  SOMETIMES, PARTICULARLY AFTER EDITING SEVERAL LINES
3830  REM  AND NOT GETTING COMPLETE LISTINGS, OR SEEING A LIST THAT
3840  REM  SHOWS SOMETHING UNEXPECTED, IT IS CONVENIENT AT THIS JUNCTURE
3850  REM  TO BE ABLE TO SEE ANOTHER LISTING
3860  REM
3870  IF Q$ = "LIST" THEN START = 0:FINISH = J - 1: GOTO 5240
3880  GOTO 4240
3890  REM
3900  REM  TO PROVIDE PROTECTION AGAINST EDITING MISTAKES A BACK-UP FILE
3910  REM  WITH THE NAME, ORIGINAL.BAK, CAN BE CREATED, HOWEVER IF
3920  REM  THIS NAME EXCEEDS 30 LETTERS IT WLL GET TRUNCATED
3930  REM  REMEMBER TO DELETE THE BACK-UP AFTER SUCCESSFUL EDITING
3940  REM
3950  PRINT
3960  PRINT "DO YOU WANT A BACK-UP FILE CREATED"
3970  INPUT "BEFORE YOU START ANY EDITING ? ";LL$
3980  IF LL$ = "YES" THEN  GOTO 4110
3990  IF LL$ = "NO" THEN  GOTO 4240
4000  REM
4010  REM  AN "INCORRECT INPUT" WARNING ROUTINE USED THROUGHOUT THE
4020  REM  PROGRAM USES CALL-998 WHICH UPS THE CURSOR 1 ROW
4030  REM
4040  PRINT : FLASH : PRINT "JUST YES OR NO, PLEASE"
4050  FOR HH = 1 TO 2000: NEXT HH
4060  NORMAL : CALL  - 998: PRINT "                                    "
4070  CALL  - 998: CALL  - 998: CALL  - 998
4080  PRINT "                                                ": CALL  - 998
4090  CALL  - 998: PRINT "                                                "
4100  CALL  - 998: FOR HH = 1 TO 200: NEXT HH: GOTO 3960
4110  IF T$ = "R" THEN  GOTO 4180
4120  PRINT D$;"OPEN"N$ + ",BAK,D"D
4130  FOR JG = 0 TO J - 1
4140  PRINT D$;"WRITE"N$ + ",BAK"
4150  PRINT A$(JG)
4160  NEXT JG
4170  GOTO 4230
4180  PRINT D$;"OPEN"N$ + ",BAK,L"L",D"D
4190  FOR JG = 0 TO J - 1
4200  PRINT D$;"WRITE"N$ + ",BAK,R"JG
4210  PRINT A$(JG)
4220  NEXT JG
4230  PRINT D$;"CLOSE"N$ + ",BAK"
4240  IF Q$ = "NO" AND CHANGEFLAG = 1 THEN  GOSUB 5290
4250  IF Q$ = "NO" AND T$ = "R" THEN  GOTO 6030
4260  IF Q$ = "NO" AND T$ = "S" THEN  GOTO 6640
4270  IF Q$ = "YES" THEN  GOTO 4350
4280  PRINT : FLASH : PRINT "JUST YES OR NO, PLEASE"
4290  FOR HH = 1 TO 2000: NEXT HH
4300  NORMAL : CALL  - 998: PRINT "                                    "
4310  CALL  - 998: CALL  - 998: CALL  - 998
4320  PRINT "                                                ": CALL  - 998
4330  CALL  - 998: PRINT "                                                "
4340  CALL  - 998: FOR HH = 1 TO 200: NEXT HH: GOTO 3780
4350  REM
4360  REM  EDITING IS DONE DIRECTLY ON THE ARRAY, A$(J)
4370  REM  A$(J) HOLDS THE FILE WITH EACH RECORD IN ITS CORRESPONDING
4380  REM  POSITION IN THE ARRAY
4390  REM
4400  REM  DELETES AND INSERTS ARE EASILY HANDLED
4410  REM  BY SHIFTING ARRAY ENTRIES
4420  REM  HOWEVER, ALL EDITING REQUIRES YOU SPECIFY THE RECORD NUMBER
4430  REM  SO THE ARRAY CAN BE MANIPULATED
4440  REM  A TRUE TEXT EDITOR WOULD LET YOU WORK DIRECTLY ON THE TEXT
4450  REM  AS IT APPEARED ON THE CRT
4460  REM
4470  PRINT : PRINT "DO YOU WISH TO:": PRINT
4480  PRINT "    C) CHANGE A RECORD"
4490  PRINT "    D) DELETE A RECORD"
4500  PRINT "    I) INSERT A RECORD"
4510  PRINT
4520  INPUT "WHICH (C, D OR I) ? ";E$
4530  IF E$ = "C" OR E$ = "D" OR E$ = "I" THEN  GOTO 4610
4540  PRINT : FLASH : PRINT "JUST C, D OR I, PLEASE"
4550  FOR HH = 1 TO 2000: NEXT HH
4560  NORMAL : CALL  - 998: PRINT "                                    "
```

```
4570  CALL  - 998: CALL  - 998: CALL  - 998
4580  PRINT "                                "
4590  CALL  - 998: FOR HH = 1 TO 200: NEXT HH
4600  GOTO 4520
4610  IF E$ = "C" THEN  GOTO 5830
4620  IF E$ = "D" THEN  GOTO 5500
4630  IF E$ = "I" THEN  GOTO 4640
4640  PRINT
4650  PRINT "WHICH POSITION SHOULD THIS NEW"
4660  INPUT "RECORD OCCUPY ? ";P
4670  IF P < 0 OR P > J OR P <  > INT (P) THEN  GOTO 4690
4680  GOTO 4760
4690  PRINT : PRINT "THE GIVEN RECORD POSITION, "P", IS"
4700  PRINT "IMPOSSIBLE. THE FILE ONLY GOES FROM"
4710  PRINT "POSITION 0 TO POSITION "J - 1
4720  PRINT : PRINT "LET'S TRY THE WHOLE THING OVER AGAIN"
4730  PRINT "HIT RETURN WHEN YOU ARE READY"
4740  PRINT "TO TRY AGAIN": GET WW$
4750  HOME : PRINT : PRINT : PRINT : GOTO 3780
4760  PRINT : PRINT "TYPE OUT THE RECORD EXACTLY AS YOU"
4770  PRINT "WISH IT TO APPEAR. REMEMBER TO ENCLOSE"
4780  PRINT "THE WHOLE ITEM IN QUOTES IF IT "
4790  PRINT "INCLUDES COMMAS OR SEMICOLONS"
4800  PRINT : INPUT "NEW RECORD: ";I$
4810  IF P = J THEN  GOTO 4850
4820  FOR JD = J TO P + 1 STEP  - 1
4830  LET A$(JD) = A$(JD - 1)
4840  NEXT JD
4850  LET A$(P) = I$
4860  LET J = J + 1
4870  PRINT
4880  LET CHANGEFLAG = 1
4890  PRINT "DO YOU WISH TO SEE ALL, SOME OR NONE"
4900  PRINT "OF THE UPDATED FILE ?": PRINT
4910  INPUT "WHICH (A, S OR N) ? ";GG$
4920  IF GG$ = "N" THEN  PRINT : PRINT "NOW ";: GOTO 3780
4930  IF GG$ = "A" THEN  LET START = 0: LET FINISH = J - 1: GOTO 5240
4940  IF GG$ <  > "S" THEN  GOTO 5130
4950  PRINT
4960  PRINT "GIVE STARTING POSITION, THEN COMMA"
4970  PRINT "THEN LAST POSITION TO BE PRINTED": PRINT
4980  INPUT "FROM,TO : ";START,FINISH
4990  IF START <  = FINISH THEN  GOTO 5050
5000  PRINT
5010  PRINT "YOUR START, "START", IS HIGHER THAN"
5020  PRINT "YOUR END, "FINISH"
5030  PRINT "REMEMBER THE RECORDS GO FROM 0 TO "J - 1
5040  PRINT : PRINT "LET'S TRY AGAIN": PRINT : GOTO 4960
5050  IF START < 0 OR FINISH > J - 1 THEN  GOTO 5070
5060  GOTO 5240
5070  PRINT : PRINT "THE POSITIONS YOU'VE GIVEN ARE NOT"
5080  PRINT "POSSIBLE. YOUR START, "START", AND"
5090  PRINT "END, "FINISH", CONFLICT WITH THE"
5100  PRINT "FILE LENGTH OF FROM POSITION 0"
5110  PRINT "TO POSITION "J - 1
5120  PRINT : PRINT "LET'S TRY AGAIN": PRINT : GOTO 4960
5130  PRINT : FLASH : PRINT "JUST A, S OR N, PLEASE"
5140  FOR HH = 1 TO 2000: NEXT HH
5150  NORMAL : CALL  - 998: PRINT "                                "
5160  CALL  - 998: CALL  - 998: CALL  - 998
5170  PRINT "                                        ": CALL  - 998
5180  CALL  - 998
5190  CALL  - 998: PRINT "                                "
5200  CALL  - 998: CALL  - 998
5210  PRINT "                                "
5220  CALL  - 998: FOR HH = 1 TO 200: NEXT HH
5230  GOTO 4890
5240  HOME : PRINT "FILE CONTENTS ARE:": PRINT
5250  FOR JE = START TO FINISH
5260  PRINT JE")";: HTAB 6: PRINT A$(JE)
5270  NEXT JE
5280  PRINT : PRINT "NOW ";: GOTO 3780
5290  REM
5300  REM  TO INSURE NO OLD DELETED RECORDS ARE USED
5310  REM  THE FILE IS DELETED AND THEN
5320  REM  JUST THE UPDATED VERSION IS WRITTEN
5330  REM
5340  IF T$ = "R" THEN  GOTO 5420
5350  PRINT D$;"DELETE"N$",D"D
5360  PRINT D$;"OPEN"N$",D"D
5370  FOR JF = 0 TO J - 1
5380  PRINT D$;"WRITE"N$
5390  PRINT A$(JF)
5400  NEXT JF
5410  GOTO 5480
5420  PRINT D$;"DELETE"N$",D"D
5430  PRINT D$;"OPEN"N$",L"L",D"D
```


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```
5440  FOR JF = 0 TO J - 1
5450  PRINT D$;"WRITE"N$",R"JF
5460  PRINT A$(JF)
5470  NEXT JF
5480  PRINT D$;"CLOSE"N$
5490  RETURN
5500  PRINT
5510  PRINT "WHAT IS THE POSITION OF THE RECORD"
5520  INPUT "YOU WANT DELETED ? ";P
5530  IF P < 0 OR P > J - 1 OR P <  > INT (P) THEN GOTO 5550
5540  GOTO 5620
5550  PRINT : PRINT "THE GIVEN RECORD POSITION, "P", IS"
5560  PRINT "IMPOSSIBLE. THE FILE ONLY GOES FROM"
5570  PRINT "POSITION 0 TO POSITION "J - 1
5580  PRINT : PRINT "LET'S TRY THE WHOLE THING OVER AGAIN"
5590  PRINT "HIT RETURN WHEN YOU ARE READY"
5600  PRINT "TO TRY AGAIN": GET WW$
5610  HOME : PRINT : PRINT : PRINT : GOTO 3780
5620  PRINT : PRINT "ONCE IT'S GONE, THERE IS NO RECOVERY"
5630  PRINT "ARE YOU SURE YOU WISH TO DELETE"
5640  PRINT : PRINT P")";: HTAB 6: PRINT A$(P): PRINT
5650  INPUT "YES OR NO ? ";ZZ$
5660  IF ZZ$ = "NO" THEN  PRINT : PRINT "OK, TRY AGAIN": PRINT
5670  IF ZZ$ = "NO" THEN  GOTO 3780
5680  IF ZZ$ = "YES" THEN  GOTO 5760
5690  PRINT : FLASH : PRINT "JUST YES OR NO, PLEASE"
5700  FOR HH = 1 TO 2000: NEXT HH
5710  NORMAL : CALL  - 998: PRINT "                                "
5720  CALL  - 998: CALL  - 998: CALL  - 998
5730  PRINT "                                "
5740  CALL  - 998: FOR HH = 1 TO 200: NEXT HH
5750  GOTO 5650
5760  IF P = J - 1 THEN  GOTO 5800
5770  FOR JD = P TO J - 2
5780  LET A$(JD) = A$(JD + 1)
5790  NEXT JD
5800  LET A$(J - 1) = ""
5810  LET J = J - 1
5820  GOTO 4870
5830  PRINT
5840  PRINT "WHAT IS THE POSITION OF THE RECORD"
5850  INPUT "TO BE CHANGED ? ";P
5860  IF P < 0 OR P > J - 1 OR P <  > INT (P) THEN  GOTO 5880
5870  GOTO 5950
5880  PRINT : PRINT "THE GIVEN RECORD POSITION, "P", IS"
5890  PRINT "IMPOSSIBLE. THE FILE ONLY GOES FROM"
5900  PRINT "POSITION 0 TO POSITION "J - 1
5910  PRINT : PRINT "LET'S TRY THE WHOLE THING OVER AGAIN"
5920  PRINT "HIT RETURN WHEN YOU ARE READY"
5930  PRINT "TO TRY AGAIN": GET WW$
5940  HOME : PRINT : PRINT : PRINT : GOTO 3780
5950  PRINT : PRINT "THE OLD RECORD IS:"
5960  PRINT : PRINT P")";: HTAB 6: PRINT A$(P)
5970  PRINT : PRINT "TYPE OUT THE NEW VERSION EXACTLY AS YOU"
5980  PRINT "WISH IT TO APPEAR, REMEMBER TO ENCLOSE"
5990  PRINT "THE WHOLE ITEM IN QUOTES IF IT"
6000  PRINT "INCLUDES COMMAS OR SEMICOLONS"
6010  PRINT : INPUT "NEW RECORD: ";A$(P)
6020  GOTO 4870
6030  PRINT : PRINT : PRINT
6040  INPUT "DO YOU WANT THIS FILE COPIED ? ";M$
6050  IF M$ = "YES" THEN  GOTO 6140
6060  IF M$ = "NO" THEN  GOTO 6320
6070  PRINT : FLASH : PRINT "JUST YES OR NO, PLEASE"
6080  FOR HH = 1 TO 2000: NEXT HH
6090  NORMAL : CALL  - 998: PRINT "                                "
6100  CALL  - 998: CALL  - 998: CALL  - 998
6110  PRINT "                                "
6120  CALL  - 998: FOR HH = 1 TO 200: NEXT HH
6130  GOTO 6040
6140  PRINT
6150  PRINT "WHAT NAME SHOULD THE COPY HAVE"
6160  INPUT NA$
6170  IF NA$ <  > "" THEN  GOTO 6220
6180  LET NA$ = N$
6190  IF D = 1 THEN  LET DR = 2
6200  IF D = 2 THEN  LET DR = 1
6210  GOTO 6240
6220  PRINT
6230  INPUT "WHICH DRIVE IS THE COPY TO GO ON ? ";DR
6240  PRINT D$;"DELETE"NA$",D"DR
6250  PRINT D$;"OPEN"NA$",L"L",D"DR
6260  FOR JC = 0 TO J - 1
6270  PRINT D$;"WRITE"NA$",R"JC
6280  PRINT A$(JC)
6290  NEXT JC
6300  PRINT D$;"CLOSE"NA$
6310  PRINT : PRINT : PRINT "THE FILE HAS BEEN COPIED"
```

```
6320  REM
6330  REM  THIS IS THE AREA WHERE THE NEXT OPTION
6340  REM  FOR RANDOM TEXT FILES SHOULD BE WRITTEN
6350  REM
6360  STOP
6370  REM
6380  REM  THIS SECTION FUNCTIONS EXACTLY THE SAME AS
6390  REM  THE RANDOM FILE SECTION
6400  REM
6410  REM  READ THE REMARKS THERE FOR A DESCRIPTION
6420  REM  OF HOW THE PROGRAM WORKS
6430  REM
6440  PRINT "WHAT IS THE NAME OF THE TEXT FILE YOU"
6450  INPUT "WISH TO LOOK AT ? ";N$
6460  PRINT
6470  INPUT "DISK DRIVE # ? ";D
6480  PRINT D$;"OPEN"N$",D"D
6490  HOME : PRINT : PRINT : PRINT
6500  PRINT "FILE CONTENTS ARE:": PRINT : PRINT
6510  FOR J = 0 TO MAXLNG
6520  PRINT D$;"READ"N$
6530  LET A$(J) = ""
6540  GET B$
6550  IF B$ = R$ THEN  GOTO 6580
6560  LET A$(J) = A$(J) + B$
6570  GOTO 6540
6580  PRINT   CHR$ (6);J")";: HTAB 6: PRINT A$(J)
6590  NEXT J
6600  REM
6610  REM  REMEMBER IT WILL BREAK OUT OF THIS LOOP
6620  REM  BECAUSE OF THE ONERR COMMAND
6630  REM
6640  PRINT : PRINT : PRINT
6650  INPUT "DO YOU WANT THIS FILE COPIED ? ";M$
6660  IF M$ = "YES" THEN  GOTO 6750
6670  IF M$ = "NO" THEN  GOTO 6930
6680  PRINT : FLASH : PRINT "JUST YES OR NO, PLEASE"
6690  FOR HH = 1 TO 2000: NEXT HH
6700  NORMAL : CALL  - 998: PRINT "
6710  CALL  - 998: CALL  - 998: CALL  - 998
6720  PRINT "                                        "
6730  CALL  - 998: FOR HH = 1 TO 200: NEXT HH
6740  GOTO 6650
6750  PRINT
6760  PRINT "WHAT NAME SHOULD THE COPY HAVE"
6770  INPUT NA$
6780  IF NA$ <  > "" THEN  GOTO 6830
6790  LET NA$ = N$
6800  IF D = 1 THEN  LET DR = 2
6810  IF D = 2 THEN  LET DR = 1
6820  GOTO 6850
6830  PRINT
6840  INPUT "WHAT DRIVE IS THE COPY TO GO ON ? ";DR
6850  PRINT D$;"DELETE"NA$",D"DR
6860  PRINT D$;"OPEN"NA$",D"DR
6870  FOR JC = 0 TO J - 1
6880  PRINT D$;"WRITE"NA$
6890  PRINT A$(JC)
6900  NEXT JC
6910  PRINT D$;"CLOSE"NA$
6920  PRINT : PRINT : PRINT "THE FILE HAS BEEN COPIED"
6930  REM
6940  REM  THIS IS THE AREA WHERE THE NEXT OPTION
6950  REM  FOR SEQUENTIAL TEXT FILES SHOULD BE WRITTEN
6960  REM
6970  STOP
6980  REM
6990  REM  ADDING THE STEPS SHOWN BELOW WILL ALLOW YOU TO READ
7000  REM  RANDOM TEXT FILES WITH UNUSED RECORDS MIXED BETWEEN
7010  REM  THE WRITTEN ONES
7020  REM  HOWEVER IT WILL NOT PERMIT COPYING OR EDITING AS THE ROUTINE
7030  REM  ENDS WITH AN ERROR AFTER THE LAST WRITTEN RECORD OF
7040  REM  THE RANDOM FILE IS PRINTED
7050  REM
7060  REM  TO INCLUDE THESE LAST FEATURES WOULD INVOLVE A MORE
7070  REM  SOPHISTICATED PROGRAM INVOLVING THE TRACK/SECTOR MAP
7080  REM  OF THE RANDOM TEXT FILE
7090  REM
7100  REM  INSERT THESE STEPS INTO THE PROGRAM
7110  REM
7120  REM  3235  LET TEMP = 0
7130  REM  3240  FOR J = TEMP TO MAXLNG
7140  REM  3622  IF Y = 5 AND T$ = "R" THEN PRINT D$;"OPEN"N$",L"L",D"D
7150  REM  3625  IF Y = 5 AND T$ = "R" THEN TEMP = J + 1 : GOTO 3240
7160  REM
7170  REM
7180  REM
7190  REM  ADDING THE LINES SHOWN BELOW WILL CAUSE LISTING
```


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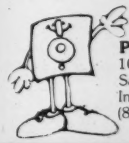

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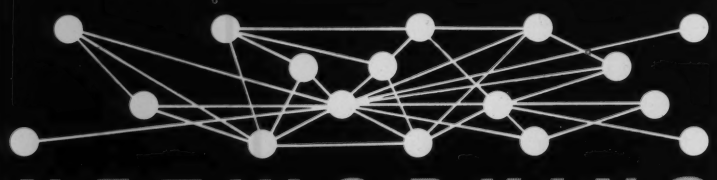

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Text Files, continued...

```
7200  REM  OF THE TEXT FILES TO BE DONE BY THE PRINTER
7210  REM  INSTEAD OF THE CRT
7220  REM
7230  REM  THEY ARE ROUTINE EXCEPT ONE MUST BE CAREFUL
7240  REM  TO BE SURE A CARRIAGE RETURN IS ALWAYS
7250  REM  PRINTED IMMEDIATELY BEFORE A DOS COMMAND IS
7260  REM     GIVEN
7270  REM  3215  PRINT : PRINT D$;"PR#1"
7280  REM  3235  PRINT D$;"PR#0" : PRINT
7290  REM  3345  PRINT : PRINT D$;"PR#1"
7300  REM  3355  PRINT D$;"PR#0" : PRINT
7310  REM
7320  REM  5240  PRINT : PRINT D$;"PR#1"
7330  REM  5245  PRINT "FILE CONTENTS ARE:" : PRINT
7340  REM  5275  PRINT D$;"PR#0"
7350  REM
7360  REM  6485  PRINT : PRINT D$;"PR#1"
7370  REM  6505  PRINT D$;"PR#0" : PRINT
7380  REM  6550  IF B$ = R$ THEN GOTO 6575
7390  REM  6575  PRINT : PRINT D$;"PR#1"
7400  REM  6585  PRINT D$;"PR#0" : PRINT
7410  REM
```

Sample Run.

```
RANDOM OR SEQUENTIAL-TYPE R OR S :R

WHAT IS THE NAME OF THE TEXT FILE YOU
WISH TO LOOK AT ? INVENTORY

LENGTH OF RECORD ? 38

DISK DRIVE ? 1


FILE CONTENTS ARE:

 0)   6 ITEMS
 1)   GUITAR STRAP,GS-62,10,3
 2)   ACOUSTICAL GUITAR,AG-34,5,2
 3)   ELECTRIC BASS,EB-71,5,1
 4)   AMPLIFIER,AM-56,2,0
 5)   ELO ALBUM,REC-156,10,-1


DO YOU WISH TO MAKE ANY CHANGES IN
THIS FILE (YES, NO, LIST) ? YES

DO YOU WANT A BACK-UP FILE CREATED
BEFORE YOU START ANY EDITING ? YES

DO YOU WISH TO:

    C) CHANGE A RECORD
    D) DELETE A RECORD
    I) INSERT A RECORD

WHICH (C, D OR I) ? I

WHICH POSITION SHOULD THIS NEW
RECORD OCCUPY ? 6

TYPE OUT THE RECORD EXACTLY AS YOU
WISH IT TO APPEAR, REMEMBER TO ENCLOSE
THE WHOLE ITEM IN QUOTES IF IT
INCLUDES COMMAS OR SEMICOLONS

NEW RECORD: "PICKS,P-12,100,20"

DO YOU WISH TO SEE ALL, SOME OR NONE
OF THE UPDATED FILE ?

WHICH (A, S OR N) ? A
FILE CONTENTS ARE:

 0)   6 ITEMS
 1)   GUITAR STRAP,GS-62,10,3
 2)   ACOUSTICAL GUITAR,AG-34,5,2
 3)   ELECTRIC BASS,EB-71,5,1
 4)   AMPLIFIER,AM-56,2,0
 5)   ELO ALBUM,REC-156,10,-1
 6)   PICKS,P-12,100,20
```

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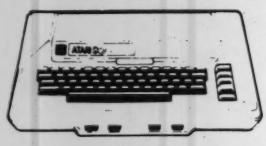

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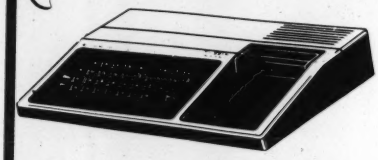

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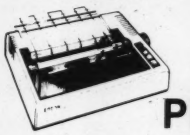

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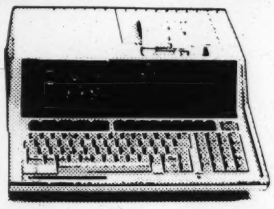

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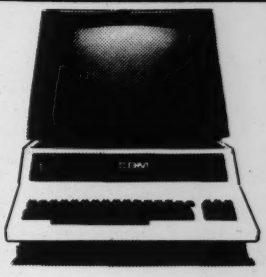

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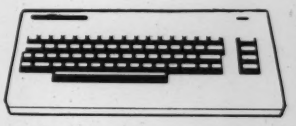

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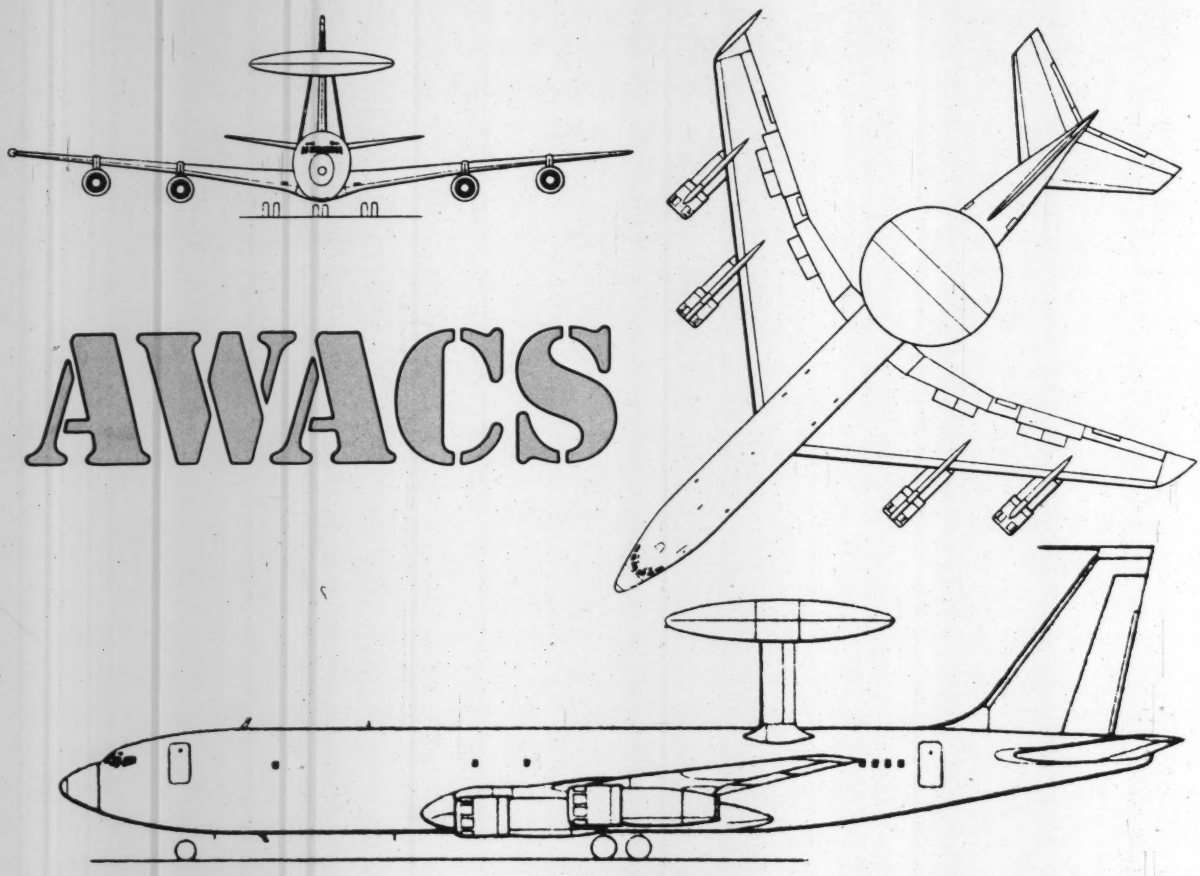

AWACS

John Hitchcock

"Mommy, why is the smoke coming out of Daddy's ears?"

"I don't know, Marla. It's something about that new computer game he's been working on. Why don't you ask him?"

"Daddy, why are you writing all those ones and zeros on that paper?"

"Well, it's like this; I wrote a whole character set into the Apple hi-resolution screen using a 3 by 5 block for each character. When I tried running the program on the TV set rather than a monitor, I realized the resolution wasn't clear enough, so I'm now doing the whole set over in 5 by 7 blocks."

"Oh. Mom, can we watch 'Little House' tonight?"

So whoever expected eight-year-olds and non-programmers to understand, anyway? That "special feeling" that occurs when you grudgingly admit that a few hours of work must be repeated can't be explained, only experienced.

John Hitchcock, 2255 E. River Rd., Cortland, NY 13045.

Anyway, it all started several weeks ago....

My job as a high school physics teacher involves quite a bit of computer programming, mainly in the area of laboratory routines or CAI modules. I also teach one class in introductory Basic, so this also involves quite a bit of activity with programming. This "routine" programming is rather interesting, but every so often I get the urge to do some "creative computing" on a major project of my own design.

The plane is a flying command post from which the events of a battle can be monitored and commanded.

Recently, I'd been getting anxious to start on another project, but was having difficulty deciding what to work on. Sometimes the hardest part of being creative is getting started, and let's face it, re-inventing the wheel is fun for only the first few times. Finally that elusive idea began to take shape.

AWACS—that's what I'd write! A program to simulate the radar screen of an AWACS aircraft. If you've followed some of the Middle East politics recently, you'll remember that AWACS is the "super radar" plane that we've used in that area of the world. The letters stand for Aircraft Warning And Control System, and the plane is a flying command post from which the events of a battle can be monitored and commanded.

The simulation I envisioned would display a radar screen on which both enemy and friendly aircraft would be displayed. The enemy planes would be en route to destroy friendly bases. The user would be able to control his own aircraft and attempt to destroy the enemy planes before his bases were attacked. Not only should the program be reasonably fast paced, but it should also require a certain degree of concentration and mental alertness.

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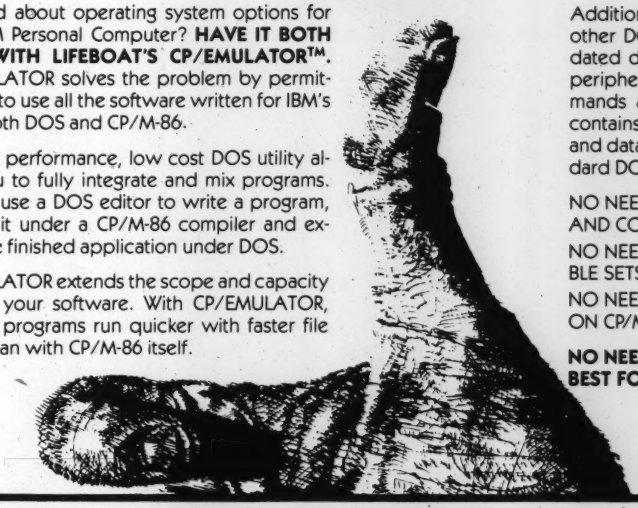

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AWACS, continued...

The idea was conceived; now the question became how to develop it and give birth to the finished program. My initial reaction was to use a popular "3-D Game Tool" to create the map display and the aircraft indicators. Then I'd get Andy, our school's resident expert in machine language, to write some routines for controlling the aircraft on the screen.

But wait! Suddenly, it's no longer *my* program! I've simply become an assembler and organizer of other people's skills. So scratch that method.

Then another philosophy began to emerge. Why not use the writing of this program to upgrade my own skills in some of these weak areas. I never had done much using shape tables of any sort, and my ability to use graphics was certainly limited. Perhaps the excitement of working on this project would provide me with the discipline needed to increase my proficiency in these areas.

A few more days of contemplation resulted in several objectives which were to be accomplished in the project:

1) The radar map should use hi-res graphics and would be redrawn periodically as the passage of aircraft erased lines on the screen. The display should also appear quickly on the screen.

2) Aircraft would be indicated by symbols or numbers defined using the Applesoft "shape tables."

3) The user should be able to control which of his planes are airborne, the firing of weapons from his planes, the speed and direction of his aircraft, and refueling of his planes.

4) It should not be necessary to use the Return key during the playing of the game.

5) Though "real-time" isn't achieved, a sense of fluidity and motion should exist.

What ultimately evolved for AWACS is indicated in the flowchart and the program listing. Those programming purists among the readers will cringe at some of the inefficiencies and cumbersome parts of the program, but perhaps a brief commentary about certain sections will show some of the rationale and philosophy which led to this particular style of programming.

The program was initially written as one unit rather than separate parts for instructions and the main program. The reason for the switch is that as the program grew in size, it began to infringe on page 1 of the hi-res graphics screen and cause inglorious things to happen to the display.

This little dilemma caused me to explore the memory mapping of the Apple and make the appropriate adjustments. The problem was solved by separating the instructions from the main body of the program.

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```
1  REM  ..........................
2  REM  ....THIS SECTION CONTAINS....
3  REM  ....THE INTRODUCTION AND ....
4  REM  ....INSTRUCTIONS FOR THE ....
5  REM  ....PROGRAM    A.W.A.C.S.....
6  REM  ..........................
10 D$ =  CHR$ (4)
20  HOME : VTAB 12: HTAB 9: PRINT "...A..W..A..C..S..."
30  VTAB 22: INPUT "DO YOU NEED INSTRUCTIONS (Y OR N)? ";A$
50  IF A$ = "Y" THEN 500
60  IF A$ = "N" THEN 110
70  GOTO 20
110  PRINT D$;"RUN AWACS"
500  REM ...BEGIN INSTRUCTIONS
510  HOME
520  PRINT "     GREETINGS, COMMANDER.  WELCOME TO  THE CONTROL BRIDGE OF
     A.W.A.C.S."
530  PRINT : PRINT "YOU ARE COMMANDING A FLEET OF SIX       FIGHTER PLANES
      AND ONE REFUELING        TANKER.  YOU MUST DEFEND YOUR TWO BASES FRO
     M AN ATTACK BY AN UNDETERMINED       NUMBER OF ENEMY FIGHTER BOMBERS.
     "
540  PRINT : PRINT "YOU CAN CONTROL THE FOLLOWING ITEMS:"
550  PRINT "  1. WHICH PLANES ARE IN THE AIR
560  PRINT "  2. THE SPEED OF YOUR AIRCRAFT
570  PRINT "  3. THE HEADING OF EACH PLANE
580  PRINT "  4. REFUELING OF EACH PLANE
590  PRINT "  5. FIRING OF 'PROXIMITY DEVICES'
600  PRINT "  6. AN 'IDENTIFY' COMMAND
610  PRINT : PRINT "YOU MUST CAUSE YOUR PLANES TO APPROACH  WITHIN A CERTA
     IN DISTANCE OF THE EMEMY  IN ORDER TO DESTROY THEM.
620  GOSUB 900
630 :
640  PRINT "A 'BEEP' SIGNALS THAT ONE OF YOUR       AIRCRAFT IS LOW ON FUE
     L.   YOU MUST USE  THE IDENTIFY COMMAND TO FIND WHICH ONE.
650  PRINT : PRINT "SINCE WE ARE IN THE MIDST OF BATTLE,    NOT ALL OF OUR
      EQUIPMENT IS WORKING.     STRANGE EVENTS MAY OCCUR IF YOU DO NOT  RES
     POND TO  COMMAND REQUESTS IN THE     APPROPRIATE TIME
660  PRINT : PRINT : GOSUB 900
670  PRINT "TO GIVE A COMMAND, YOU MUST TYPE THE    LETTER OF THE COMMAND.
       WHEN ASKED, YOU MUST TYPE THE NUMBER OF THE PLANE TO
680  PRINT "WHICH THE COMMAND IS DIRECTED.
690  PRINT : PRINT "THEN YOU MUST TYPE THE APPROPRIATE       NUMBER FOR THE
      INFORMATION REQUESTED     BY THE COMMAND.
700  PRINT : PRINT "IF YOU DO NOT RESPOND TO THE COMMAND    REQUEST IN THE
      PROPER AMOUNT OF TIME    STRANGE EVENTS MAY OCCUR!
710  GOSUB 900
720  PRINT "FOLLOWING IS A LIST OF THE COMMANDS     AVAILABLE TO YOU:"
730  PRINT : PRINT "S     'SCRAMBLE' AN AIRCRAFT (1-7)
740  PRINT : PRINT "V     CHANGE THE VELOCITY (1-3)
750  PRINT : PRINT "H     CHANGE THE HEADING (1-8)
760  PRINT "                 1
770  PRINT "               8   2
780  PRINT "             7       3
790  PRINT "               6   4
800  PRINT "                 5
810  PRINT : PRINT "F     FIRE A WEAPON FROM PLANE(1-6)
820  PRINT : PRINT "R     REFUEL PLANE (1-6)
830  PRINT : PRINT "I     IDENTIFY STATUS OF PLANES(1-7)
840  GOSUB 900
850  HOME : VTAB 12: PRINT "CAPTAIN, ARE YOU READY? (Y OR N) ";: GET A$
860  IF A$ <  > "Y" THEN 850
870  VTAB 12: HTAB 9: PRINT "RADAR UNIT INITIALIZING"
880  PRINT  CHR$ (13)
890  PRINT D$;"RUN AWACS"
900  PRINT : PRINT "TYPE ANY KEY FOR MORE DATA ";: GET A$: POKE  - 16368,0
     : HOME : RETURN
```

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AWACS, continued...

Adjustments to the main program consisted of setting LOMEM to decimal 24576 to keep the string storage from entering the hi-res screen storage. This was done in line 10 of the main program. The main program was also written with many commands on one line to conserve memory space.

Perhaps the excitement of working on this project would provide me with the discipline needed to improve my programming skills.

Most of the actual program can be followed by reading the REM statements in the listing. In order to assure proper operation, those lines with REM statements should be removed prior to running.

One difficulty does exist for which I have not yet found an answer. To control the aircraft, I wanted the user to type in a certain command (for instance, "S" to scramble one of his planes), and then immediately be able to type a number to indicate which plane was to become airborne.

```
0  REM ..............................
1  REM .........A.W.A.C.S............
2  REM ...BY JOHN HITCHCOCK..........
3  REM ...CORTLAND, NEW YORK.........
4  REM ..............................
5  REM ...SET LOMEM TO PREVENT PROGRAM FROM ENTERING HI-RES SCREEN
6 :
7 :
10  LOMEM: 24576
11 :
12 :
15  REM ...SET VARIABLES TO READ KEYBOARD AND RESET STROBE...POKES INDICAT
    E WHERE SHAPES ARE STORED
17 :
18 :
20 D$ =  CHR$ (4):RS =  - 16368:RK =  - 16384
30  DIM D%(15,10): POKE 232,0: POKE 233,64
40  HGR : TEXT
50  HOME : VTAB 12: HTAB 11: PRINT "RADAR UNIT INITIALIZING"
60  PRINT D$;"BLOAD AWAC SHAPES"
61 :
62 :
65  REM ...ESTABLISH INITIAL STATUS OF ALL AIRCRAFT
66 :
67 :
70  FOR R = 1 TO 15
80  IF R = 10 THEN D%(R,0) = 1
90 D%(R,1) = 1
100  IF (R = 12) OR (R = 13) THEN D%(R,1) = 2
110  IF R > 13 THEN D%(R,5) = 250:D%(R,6) = 10:D%(14,1) = 5:D%(15,1) = 7
120 D%(R,2) = 1:D%(R,4) =  - 1
130  IF R > 13 THEN D%(R,4) = 0
140  IF R < 8 THEN D%(R,5) = 250:D%(R,6) = 130
150  IF R > 7 AND R < 14 THEN D%(R,5) = 40:D%(R,6) = 100
160  IF R < 8 THEN D%(R,7) = R
170  IF R > 7 THEN D%(R,7) = 8
180  IF R < 7 THEN D%(R,8) = 1:D%(R,9) = 75:D%(R,10) = 3
190  IF R = 7 THEN D%(R,8) = 2:D%(R,9) = 1500:D%(R,10) = 1
200  IF R > 7 THEN D%(R,8) = 4:D%(R,9) = 1000:D%(R,10) = 0
210  NEXT
215 :
216 :
220  GOSUB 1880
230  ROT= 0: SCALE= 1
233 :
234 :
235  REM ...LINES 240-270 DETERMINE WHICH PLANES ARE IN THE AIR, THEIR FLI
    GHT STATUS, CALCULATES NEW POSITION AND DRAWS NEW POSITION
236 :
237 :
240  FOR R = 1 TO 15
250  IF D%(R,0) = 0 THEN 470
260  IF D%(R,0) =  - 1 THEN 470
270  HCOLOR= 0: DRAW D%(R,7) AT D%(R,5),D%(R,6): HCOLOR= 3
280  IF D%(R,1) = 1 THEN D%(R,3) = 0:D%(R,4) =  - 1
290  IF D%(R,1) = 2 THEN D%(R,3) = 1:D%(R,4) =  - 1
300  IF D%(R,1) = 3 THEN D%(R,3) = 1:D%(R,4) = 0
310  IF D%(R,1) = 4 THEN D%(R,3) = 1:D%(R,4) = 1
320  IF D%(R,1) = 5 THEN D%(R,3) = 0:D%(R,4) = 1
330  IF D%(R,1) = 6 THEN D%(R,3) =  - 1:D%(R,4) = 1
340  IF D%(R,1) = 7 THEN D%(R,3) =  - 1:D%(R,4) = 0
350  IF D%(R,1) = 8 THEN D%(R,3) =  - 1:D%(R,4) =  - 1
360  IF D%(R,2) = 1 THEN D%(R,9) = D%(R,9) - 1
370  IF D%(R,2) > 1 THEN D%(R,9) = D%(R,9) - 2
380  IF D%(R,9) <  = 0 THEN D%(R,0) =  - 1
390  IF D%(R,9) < 15 THEN  PRINT  CHR$ (7);
400 DX = D%(R,2) * D%(R,3)
410 DY = D%(R,2) * D%(R,4)
420 D%(R,5) = D%(R,5) + DX
430 D%(R,6) = D%(R,6) + DY
440  IF D%(R,5) < 3 OR D%(R,5) > 276 THEN D%(R,5) = 0:D%(R,0) =  - 1
450  IF D%(R,6) < 3 OR D%(R,6) > 156 THEN D%(R,6) = 0:D%(R,0) =  - 1
460  DRAW D%(R,7) AT D%(R,5),D%(R,6)
470  NEXT R
472 :
473 :
475  REM ...LINES 480 AND 490 CHECK TO SEE IF A COMMAND KEY HAS BEEN PRESS
    ED. IF SO, THEN JUMP TO 770
476 :
477 :
480 X =  PEEK (RK): POKE RS,0
490  IF X > 127 THEN 770
500 :
501 :
502 :
505  REM ...LINES 510-750 DETERMINE FLIGHT PATTERN OF ENEMY PLANES AND DET
    ERMINE IF A BASE IS ATTACKED
506 :
507 :
```


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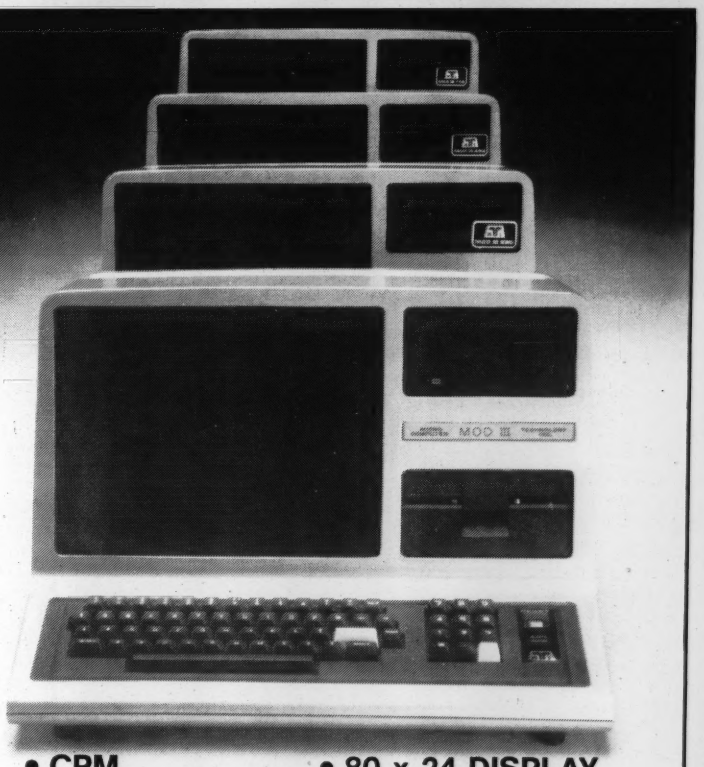

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AWACS, continued...

This is initially done is line 480 where X becomes the value of location -16384. POKEing the value of RS (-16368) resets the strobe so another value can be read in. If a key has been pressed, then the program branches from line 490 to 770. Lines 770-820 check to see if the key pressed is one of the valid command moves. If not, the program returns to line 500 to continue the flight of the planes.

If the key pressed is a valid command, then the program branches to the appropriate sub-routine to handle the rest of the command sequence. And that's where the trouble begins. To illustrate the problem, suppose the user wants to change the heading of one of his planes. He presses the letter "H" (ASCII 200) which is first detected at lines 480 and 490. Line 780 identifies the key pressed as an "H" and then routes the program to line 890.

I originally wanted the program to look something like the following:

```
900 FOR K = 1 TO 250
910 X = PEEK (RK): POKE RS,0
920 IF (X>48) AND (X<58) THEN
    P=X:X=0:GOTO940
930 NEXT K:GOTO500
```

At line 940 a similar sequence would occur in which the user was asked for the value of the heading to be entered. The difficulty was that the second loop was never executed properly, and the value

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```
510 FC = FC + 1
520  IF FC = 2 THEN D%(8,0) = 1:D%(9,0) = 1:D%(10,0) = 1:D%(10,1) = 3: GOTO
     740
530  IF FC = 20 THEN D%(11,0) = 1:D%(12,0) = 1:D%(13,0) = 1: GOTO 740
540  IF FC = 52 THEN D%(8,1) = 2:D%(9,1) = 4:D%(11,1) = 3: GOTO 740
550  IF FC = 70 THEN D%(12,1) = 1: GOTO 740
560  IF FC = 80 THEN D%(13,1) = 4:D%(13,2) = 3: GOTO 740
570  IF FC = 87 THEN D%(8,1) = 3:D%(8,2) = 3: GOTO 740
580  IF FC = 100 THEN D%(14,0) = 1:D%(15,0) = 1:D%(14,2) = 5:D%(15,2) = 3:
     GOTO 740
590  IF FC = 102 THEN D%(9,1) = 2:D%(10,1) = 4:D%(10,2) = 3:D%(12,1) = 3: GOTO
     740
600  IF FC = 115 THEN D%(10,1) = 3:D%(13,1) = 3: GOTO 740
610  IF FC = 120 AND D%(8,0) > 0 THEN  GOSUB 1830
620  IF FC = 125 AND D%(15,0) > 0 THEN  GOSUB 1830
630  IF FC = 126 AND D%(14,0) > 0 THEN  GOSUB 1840
640  IF FC = 130 THEN D%(13,1) = 4
650  IF FC = 135 THEN D%(11,1) = 1:D%(11,2) = 3:D%(12,2) = 3: GOTO 740
660  IF FC = 138 AND D%(10,0) > 0 THEN  GOSUB 1840
670  IF FC = 140 AND D%(13,0) > 0 THEN  GOSUB 1840
680  IF FC = 142 THEN D%(9,2) = 3: GOTO 740
690  IF FC = 155 AND D%(12,0) > 0 THEN  GOSUB 1830
700  IF FC = 156 AND D%(11,0) > 0 THEN  GOSUB 1830
710  IF FC = 157 AND D%(9,0) > 0 THEN  GOSUB 1830
720  IF TB = 1 AND FB = 1 THEN 1850
730  IF FC > 157 THEN 1860
740  VTAB 21: HTAB 1: CALL  - 958: PRINT "COMMAND = ";FC
750  GOSUB 1880
760  GOTO 240
761 :
762 :
765  REM ...CHECK TO SEE WHICH COMMAND KEY HAS BEEN PRESSED
766 :
767 :
770  IF X = 211 THEN X = 0: GOTO 840
780  IF X = 200 THEN X = 0: GOTO 890
790  IF X = 198 THEN X = 0: GOTO 1250
800  IF X = 214 THEN X = 0: GOTO 1090
810  IF X = 210 THEN X = 0: GOTO 1550
820  IF X = 201 THEN X = 0: GOTO 1700
830  GOTO 510
832 :
833 :
835  REM ...'SCRAMBLE' YOUR AIRCRAFT
836 :
837 :
840  VTAB 21: CALL  - 958: PRINT "SCRAMBLE WHICH PLANE (1-7)?"
850  FOR K = 1 TO 250
860 X =  PEEK (RK): POKE RS,0
870  IF (X > 48) AND (X < 58) THEN X = X - 48:D%(X,0) = 1: GOTO 500
880  NEXT : GOTO 500
882 :
883 :
885  REM ...CHANGE HEADING OF YOUR AIRCRAFT
886 :
887 :
890  VTAB 21: CALL  - 958: PRINT "WHICH PLANE (1-9)?";
900  FOR K = 1 TO 250
910 X =  PEEK (RK): POKE RS,0
920  IF (X > 48) AND (X < 58) THEN P$ =  CHR$ (X):P =  VAL (P$):X = 0: PRINT
     P: GOTO 940
930 X = 0: NEXT : GOTO 500
940  VTAB 23: CALL  - 958: PRINT "WHAT HEADING (1-8)?";
950  FOR K = 1 TO 250
960 X =  PEEK (RK): POKE RS,0
970  NEXT
980  IF (X > 48) AND (X < 57) THEN H$ =  CHR$ (X): PRINT H$:H =  VAL (H$):
     X = 0: GOTO 1000
990  GOTO 500
1000 D%(P,1) = H
1010  IF H = 1 THEN D%(P,3) = 0:D%(P,4) =  - 1: GOTO 500
1020  IF H = 2 THEN D%(P,3) = 1:D%(P,4) =  - 1: GOTO 500
1030  IF H = 3 THEN D%(P,3) = 1:D%(P,4) = 0: GOTO 500
1040  IF H = 4 THEN D%(P,3) = 1:D%(P,4) = 1: GOTO 500
1050  IF H = 5 THEN D%(P,3) = 0:D%(P,4) = 1: GOTO 500
1060  IF H = 6 THEN D%(P,3) =  - 1:D%(P,4) = 1: GOTO 500
1070  IF H = 7 THEN D%(P,3) =  - 1:D%(P,4) = 0: GOTO 500
1080  IF H = 8 THEN D%(P,3) =  - 1:D%(P,4) =  - 1: GOTO 500
1090 C = 0:X = 0
1092 :
1093 :
1095  REM ...CHANGE VELOCITY OF AIRCRAFT
1096 :
1097 :
1100  VTAB 21: CALL  - 958: PRINT "CHANGE VEL. WHICH PLANE (1-9)?";
1110 X =  PEEK (RK): POKE RS,0
1120  IF (X > 48) AND (X < 58) THEN  PRINT X - 48: GOTO 1160
1130 C = C + 1
1140  IF C < 250 THEN 1110
1150  GOTO 500
1160  VTAB 23: CALL  - 958: PRINT "NEW VELOCITY (1-3)?";
```

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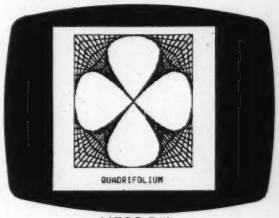

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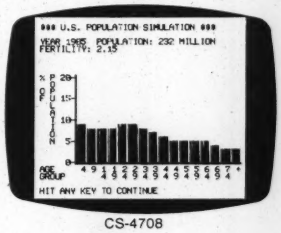

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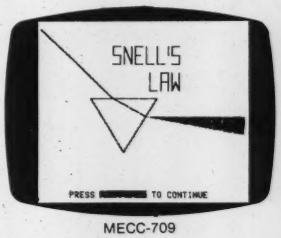
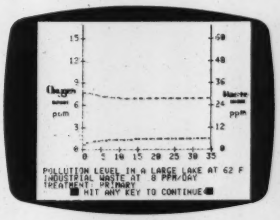
"Limits" is a microcomputer version of the well known "Limits to Growth" project done by the Club of Rome. It contains a model of a world that is built of five subsystems (population, pollution, food supply, industrial output, and resource usage) linked together by six variables: birth rate, death rate, pollution generation, resource usage rate, industrial output growth rate, and food production rate. "Market" allows two or more people to play the roles of companies who are competing for the market for a particular product. Each player makes marketing decisions quarterly including the production level, the advertising budget, and the unit price of the product for his company. "USPOP" allows the user to study many aspects of the United States' human demography (population change) including population growth, age and sex distribution. "USPOP" makes population projections and investigates the consequences of many different demographic changes. Requires 48K. Applesoft or Apple II Plus. $24.95. (Also available for PET/CBM and TRS-80.)



MECC-709

MECC-707



CS-4707

CS-4704

Disk CS-4706 Ecology Simulations I
"POP" demonstrates the strengths and the weaknesses of population projection by showing how three simple population-growth models give vastly different projections for a sample population's growth. At the same time students are introduced to the concept of successive refinement of a model, since each successive POP model adds details that the previous model lacked. Effectiveness of two different methods of pest control can be explored in "STERL". These are: 1. the use of pesticides, and 2.the release of sterile males. "TAG" simulates one technique ("tagging and recovery") that is used by scientists to estimate the animal population in a designated area. "BUFFALO" allows the exploration of "what if" questions and experimentation with ecological policies that might prove disastrous in real life, as students formulate harvesting policies. Requires 48K Applesoft or Apple II Plus. $24.95. (Also available for PET/CBM and TRS-80.)

Disk CS-4707 Ecology Simulations II
"Pollute" demonstrates the basic scientific and economic factors involved in the water pollution problem. The student uses the computer to investigate the effects of different variables such as water temperature and rate of dumping waste material. In "Rats" the student is a health department official devising a plan to control rats in a given area. The plan can be varied to determine the most effective strategy for controlling the rat population. With "Malaria", the student plays the role of a health official trying to control a malaria epidemic while simultaneously taking into account financial considerations. "Diet" is a computer program designed to let the student explore the quality of a diet of four basic substances: calories, protein, lipids, and carbohydrates. Requires 48K Applesoft in ROM or Apple II Plus. $24.95. (Also available for PET/CBM and TRS-80.)

Disk CS-4710 Trucker and Streets of the City
"Streets of the City" is a simulation modeled on Grand Rapids, Michigan, a metropolitan area with a population of 550,000. The budgeting, cost and work standard bases are derived from actual experiences of the city over the past five years. The objective of the simulation is to complete a ten-year plan of street and transit improvements while retaining the support of a majority of the City Commission. "Trucker" simulates coast-to-coast trips by an independent trucker hauling various cargos. The goal of the game is to keep on schedule while avoiding bad weather, road construction, speeding tickets, and flat tires. 48K Applesoft or Apple II Plus. $24.95 (also available for TRS-80, Atari, and PET).

Disk CS-4704 Hail to the Chief
The object in this simulation is to be elected president. In the campaign the player sets his strategy and carries it out week by week. He may run TV or magazine ads, travel to different states, hold news conferences and participate in a debate. The package includes four models of varying complexity; each can be used at ten levels of difficulty. The more complex models introduce the influences of incumbancy, campaign finance, and spending limits. "Hail to the Chief" has been used as a teaching aid in Political Science, Voting Behavior, and Computer Science at the University level since 1976. It is a well proven package which includes a comprehensive manual. Requires 48K Apple II Plus or Applesoft. $24.95.

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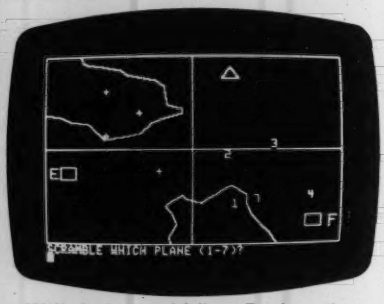
AWACS, continued...

of the heading always turned out to be the value of the plane which was to be controlled. The method which I use in the program uses a loop like 950-970 to take some time and reset the keyboard strobe with certainty. Now I know that there is a much better way to accomplish this task, but for the life of me, I have been unable to find it. Perhaps you have the answer.



Well, that's a semi-failure. But how about one of the successes of the project. The subroutine at 1870 is used to draw the map portion of the radar screen. The original version of the program simply had lines 1920-2130 incorporated into the early portion of the program. As planes crossed portions of the map display, they would erase part of the map. This was originally corrected by putting the map

```
1170  FOR K = 1 TO 400: POKE RS,0: NEXT K
1180 P = X - 48:C = 0:X = 0
1190 X =  PEEK (RK): POKE RS,0
1200  IF (X > 48) AND (X < 52) THEN  PRINT X - 48: GOTO 1240
1210 C = C + 1
1220  IF C < 250 THEN 1190
1230  GOTO 500
1240 D%(P,2) = X - 48: GOTO 500
1242 :
1243 :
1245  REM ...FIRE 'PROXIMITY MISSLE' FROM YOUR AIRCRAFT
1246 :
1247 :
1250  VTAB 21: CALL  - 958: PRINT "FIRE WHICH PLANE (1-6)?";
1260 X = 0
1270  FOR K = 1 TO 250
1280 X =  PEEK (RK): POKE RS,0
1290  IF (X > 48) AND (X < 55) THEN  PRINT X - 48:P = X - 48: GOTO 1310
1300  NEXT : GOTO 500
1310  FOR K = 1 TO 200: NEXT
1320  IF D%(P,0) < 1 THEN  VTAB 21: PRINT "AIRCRAFT NOT FLIGHT STATUS": FOR
     Z = 1 TO 1000: NEXT Z: GOTO 500
1330  IF D%(P,10) <  = 0 THEN 1470
1340 D%(P,10) = D%(P,10) - 1
1350  VTAB 21: CALL  - 958: PRINT "PROXIMITY DEVICE LAUNCHED"
1360  FOR K = 1 TO 50:X =  PEEK ( - 16336): NEXT
1370  FOR K = 8 TO 15
1380  IF ( ABS (D%(K,5) - D%(P,5)) < 6) AND ( ABS (D%(K,6) - D%(P,6)) < 6)
     THEN D%(P,0) =  - 1: GOTO 1500
1390  IF ( ABS (D%(K,5) - D%(P,5)) < 11) AND ( ABS (D%(K,6) - D%(P,6)) < 1
     1) THEN HC = HC + 1:D%(K,0) =  - 1
1400  NEXT K
1410  FOR K = 1 TO 200: NEXT
1420  VTAB 23: CALL  - 958: PRINT "YOU SCORED ";HC;" HITS .... ";
1430  IF HC > 0 THEN  PRINT "GOOD JOB"
1440  IF HC <  = 0 THEN  PRINT "KLUTZ"
1450  FOR Z = 1 TO 1000: NEXT Z
1460 HC = 0: GOTO 500
1470  VTAB 23: CALL  - 958: PRINT "WEAPONS DEPLETED"
1480  FOR Z = 1 TO 1000: NEXT Z
1490  GOTO 500
1500  VTAB 21: CALL  - 958
1510  FOR K = 1 TO 5: PRINT  CHR$ (7):: NEXT
1520  PRINT "WHAT A DUNDERHEAD...YOU WERE TOO CLOSE  BEFORE YOU FIRED AND
     WERE SHOT DOWN.
1530  FOR Z = 1 TO 1000: NEXT Z: GOTO 500
1538 :
1539 :
1540  REM ...REFUEL
1541 :
1542 :
1550  VTAB 21: CALL  - 958: PRINT "REFUEL WHICH PLANE(1-6)?:
1560  FOR K = 1 TO 250
1570 X =  PEEK (RK): POKE RS,0
1580  IF (X > 48) AND (X < 57) THEN 1600
1590 X = 0: NEXT K: GOTO 500
1600  REM ...CHECK REFUEL
1610 P = X - 48
1620  IF ( ABS (D%(P,5) - D%(7,5)) > 5) OR ( ABS (D%(P,6) - D%(7,6)) > 5) THEN
     1670
1630 D%(P,9) = 75
1640  VTAB 23: CALL  - 958: PRINT "NOW REFUELED...RESUME MISSION"
1650  FOR K = 1 TO 500: NEXT K
1660  GOTO 500
1670  VTAB 23: CALL  - 958: PRINT "CAPTAIN, YOU ARE OUT OF RANGE"
1680  FOR K = 1 TO 500: NEXT K: GOTO 500
1688 :
1689 :
1690  REM ...IDENTIFY ROUTINE
1691 :
1692 :
1700  VTAB 21: CALL  - 958: PRINT "IDENTIFY WHICH PLANE(1-7)?"
1710  FOR K = 1 TO 250
1720 X =  PEEK (RK): POKE RS,0
1730  IF (X > 48) AND (X < 56) THEN P = X - 48: GOTO 1750
1740 X = 0: NEXT K: GOTO 500
1750  REM ...IDENT
1760  IF D%(P,8) = 1 THEN T$ = "FIGHTER"
1770  IF D%(P,8) = 2 THEN T$ = "TANKER"
1780  VTAB 21: CALL  - 958: PRINT "TYPE..";T$
1790  PRINT "FUEL..";D%(P,9)
1800  PRINT "WEAPONS..";D%(P,10)
1810  FOR K = 1 TO 1000: NEXT K
1820  GOTO 500
1822 :
1823 :
1825  REM ...YOUR BASES ATTACKED
1826 :
1827 :
1830  VTAB 21: CALL  - 958: PRINT "TRIANGLE BASE ATTACKED": FOR Z = 1 TO 1
     000: NEXT Z:TB = 1: RETURN
```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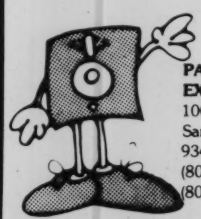

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into a GOSUB that periodically re-drew directly on the visible screen and took a few seconds to complete. Spending an hour or so with the screen switches (page 12, 13 of the Apple II Reference Manual) resulted in lines 1880 and 2160 which draw the map in memory before displaying it all at once on the screen.

Suggested Improvements

I've yet to write a program which doesn't have a great deal of room for improvement or revision, and this one is no exception. Some changes or additions could be:

1) Add ships or submarines to the seas.

2) Make "aimed" missiles and show their paths as they travel. They should be fast, but able to be evaded with fast reactions.

3) Include neutral aircraft which, if accidentally shot down, would precipitate a massive attack from "the North."

4) Giant explosions should occur when your bases are attacked.

5) The user should have a bomber which can attack the enemy air base.

I certainly can't say this program has any "redeeming social value," nor does the programming technique provide subtle insights into the intricacies of Basic. What if did for me, however, was to provide the thrill and satisfaction of getting a reasonably sophisticated idea to work acceptably on the screen. I realized that my own programming had reached an inevitable plateau, and this project provided the impetus to get off that plateau and onto a higher one.

Most of us amateur programmers could benefit greatly if we periodically searched for a project idea that would take us beyond our present skill level. □

```
1840  VTAB 21: CALL  - 958: PRINT "FIGHTER BASE ATTACKED": FOR Z = 1 TO 10
      00: NEXT Z:FB = 1: RETURN
1850  FOR K = 1 TO 7: HCOLOR= K: HPLOT 0,0: CALL 62454: FOR Z = 1 TO 250: NEXT
      Z: NEXT K: VTAB 21: HTAB 1: CALL  - 958: PRINT "URGENT MESSAGE...ALL
      BASES DESTROYED....SUGGEST YOU SURRENDER IMMEDIATELY.....": END
1860  VTAB 21: CALL  - 958: PRINT "GREAT JOB, CAPTAIN..YOU HAVE DESTROYED
      ALL THE ENEMY BOMBERS AND WIN THE WAR!": END
1868 :
1869 :
1870  REM ...MAP DRAW
1871 :
1872 :
1880  POKE 49239,0: POKE 49236,0
1890 :
1900 :
1910 :
1920  HCOLOR= 3
1930  HPLOT 0,0 TO 279,0 TO 279,159 TO 0,159 TO 0,0
1940  HPLOT 140,0 TO 140,159
1950  HPLOT 0,80 TO 279,80
1960  HPLOT 175,10 TO 183,20 TO 167,20 TO 175,10
1970  HPLOT 15,95 TO 30,95 TO 30,105 TO 15,105 TO 15,95
1980  HPLOT 12,96 TO 5,96 TO 5,104 TO 12,104: HPLOT 5,100 TO 10,100
1990  HPLOT 245,135 TO 260,135 TO 260,145 TO 245,145 TO 245,135
2000  HPLOT 275,136 TO 268,136 TO 268,146: HPLOT 268,140 TO 273,140
2010 X = 35:Y = 0
2020  FOR K = 1 TO 39
2030  READ A,B
2040  HPLOT X,Y TO A,B
2050 X = A:Y = B
2060  IF K = 19 THEN X = 120:Y = 159
2070  NEXT K
2080  DATA 37,6,41,8,56,10,73,13,79,17,106,22,114,27,117,43
2090  DATA 130,46,130,50,110,55,102,58,91,67,75,70,58,72
2100  DATA 42,58,25,56,15,52,0,50
2110  DATA 118,154,125,143,124,140,120,132,115,127
2120  DATA 122,122,130,118,135,122,148,125,155,120,162,117,170,112
2130  DATA 175,110,183,114,190,118,190,125,195,135,203,143,212,150,219,159
2140 :
2150 :
2160  POKE 49235,0: POKE 49232,0
2170  RESTORE
2180  RETURN
```

THE FOLLOWING LISTING GIVES THE MACHINE LANGUAGE CODE FOR THE SHAPE TABLE USED IN THE PROGRAM A.W.A.C.S.

TYPE CALL-151 TO ENTER THE MONITER AND THEN ENTER THE FOLLOWING LISTING.

REMEMBER TO CHANGE EACH DASH IN THE LISTING BELOW TO A COLON.

AFTER YOU HAVE ENTERED THIS SECTION PRESS THE 'RESET' KEY TO RE-ENTER BASIC. NOW TYPE BSAVE AWAC SHAPES,A$4000,L$7F TO SAVE THE SHAPES ON THE DISK.

```
]CALL-151

*4000.407F

4000- 08 00 12 00 1D 00 2C 00
4008- 39 00 46 00 55 00 64 00
4010- 6F 00 24 2F 36 36 36 2D
4018- 1D 3F 3F 05 00 2D 24 3C
4020- 3F 2F 2D 35 36 3F 3F 36
4028- 2E 2D 3D 00 2D 24 3C 3F
4030- 2F 2D 35 36 36 3E 3F 3F
4038- 00 3F 24 34 36 2D 2D 27
4040- 24 36 36 36 04 00 3F 24
4048- 2C 2D 3D 3F 37 36 2D 2D
4050- 36 3E 3F 2F 00 3F 24 2C
4058- 2D 3D 3F 37 36 36 2E 2D
4060- 25 24 3F 00 09 24 3C 3F
4068- 2F 2D 35 36 36 26 00 24
4070- 36 2D 3F 3F 2D 36 04 00
4078- 07 05 05 06 06 04 00 00
*
```


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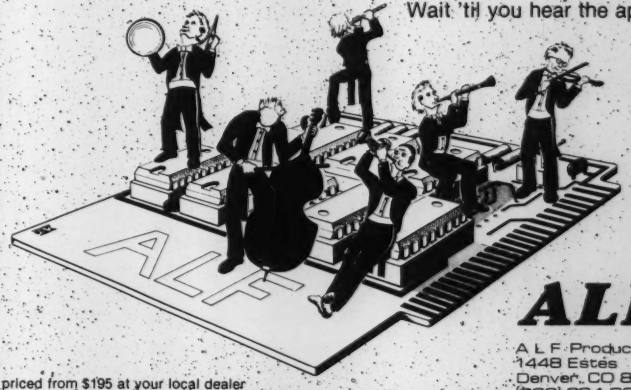

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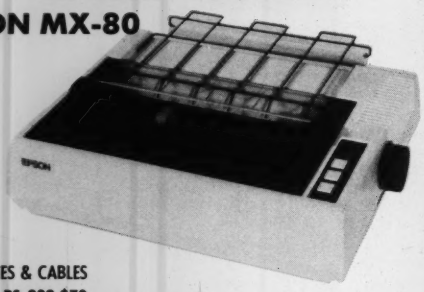

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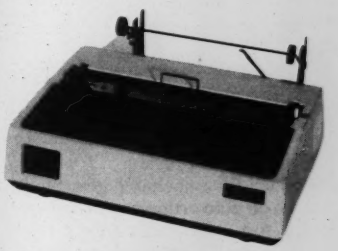

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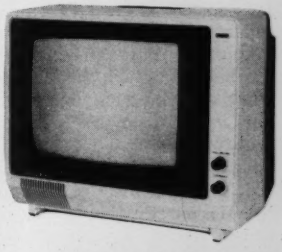

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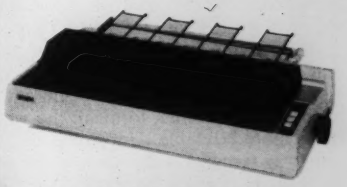

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CIRCLE 213 ON READER SERVICE CARD

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Chuck Carpenter

As promised, a review of *Program Line Editor* (PLE) is included this month. A tutorial on converting hex to decimal and back is, too. Other items include one-liners and answers to questions from readers. The review of PLE was written by Barry Bayer. Some of you may recognize his name from articles and columns he has written in this and other magazines.

Barry wrote me a letter some time ago and asked me why I was still telling people to use POKE 33,33 to help with their editing, especially since this great PLE program was available. I have PLE but I have never gotten around to using it. When Barry was asked to help, he graciously consented. Here, only slightly edited, is a review of *Program Line Editor* by Barry Bayer.

Program Line Editor

One of the most irritating features of the Apple II is the clearly inadequate editor used when entering or modifying Integer Basic or Applesoft floating point Basic programs. Try to insert a letter or two into an Applesoft program, particularly with the old, non-autostart monitor ROM, and by the time you're finished with a complicated sequence of CTRL-As, CTRL-Bs, and all sorts of other controls, you can get a little disgusted with the whole thing.

When a line is listed, the editor automatically includes spaces between keywords, and at the end and beginning of each 34 column line, to make the whole thing more readable. Unfortunately, the only way to make a change in a line is to list it, copy it using the Right Arrow key until the point of change, and continue to copy it to the end.

Chuck Carpenter, 2228 Montclair Pl., Carrollton, TX 75007.

Unless one carefully advances the cursor with a CTRL A, (ESC K with the autostart monitor ROM) strings tend to be broken up and look terrible. By the time you get to the end, the editor decides that all of those spaces that it put in (that you didn't want to begin with) make the line too long, and issues a *** SYNTAX ERROR message, and ignores the entire modification.

Some problems (squaring the circle, the Middle-East situation) may never be solved. But there are two generally used methods to solve the Apple II editor problems. The first (as has previously been discussed in this column) is to narrow the text window to 34 characters, which eliminates the "prettyprinting" function of the editor (POKE 33,33 does it); the second is to use Neil Konzen's *Program Line Editor*, or PLE, as it is affectionately known.

PLE is a strange type of program that almost everyone has and uses, but nobody ever talks about. For the benefit of new Apple owners, and for you old timers who may not have heard of it, let me describe a program that is really indispensible.

PLE comes well documented, on a DOS 3.2 disk, and is both copyable and Muffinable (to DOS 3.3). It is available commercially through Synergistic Software, and would be well worth its suggested retail price of $40 if all it did was to solve the "line editing" problems outlined above.

When you run PLE, it lowers HIMEM and the DOS buffers (about 1500 bytes), changes the DOS pointers, and installs itself immediately below DOS and above the DOS buffers and new HIMEM. And there it stays, unaffected by FPs, INTs or even hard RESETs, always ready to do its stuff.

Load a program, in either Integer Basic or Applesoft. Find a line that you wish to edit, and key in CTRL-E and the line number. Thus far, you have done the equivalent of a LIST line number. But now starts the fun.

The sequence of CTRL-F and any keyboard letter or number key, will find the next occurrence of the character in the line. Press the same key again, and the cursor goes to the next occurrence of that character. Press any other key to get out of the sequence. CTRL-N puts the cursor at the end of the line, and CTRL-B puts it at the beginning. CTRL-Z will ZAP from the current cursor position up to, but not including the character pressed after the CTRL-Z. (A CTRL-Z ":" sequence is an excellent way to eliminate a single statement in a multiple statement line. A second ":" will eliminate a second statement, and so forth.)

A CTRL-P will pack the line and remove all the spaces between tokenized words (just in case the line may be getting too long because of all of those extra spaces inserted by the Basic editor.) But the best thing about all of this is that, once the change is made, a Return is sufficient to enter the new line. *You don't have to recopy the whole thing.* (Note that a tokenized word is a reserved keyword like PRINT. The interpreter assigns a token of only one byte to each reserved word to conserve memory. See page 121 in the Applesoft Reference Manual.—CC).)

But there is more. Move to the place in the line where you wish to insert characters, press CTRL-I, and start typing. PLE moves everything over to the right to make room for your insertion, be it a character, a word, or a full statement or two. And of course, a CTRL-D will delete characters. CTRL-A performs a case change trans-

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CIRCLE 189 ON READER SERVICE CARD

Fantasy for your ATARI

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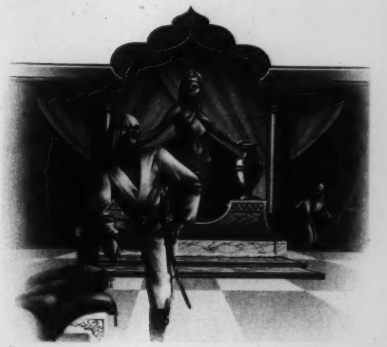
and the forty thieves

By Stuart Smith



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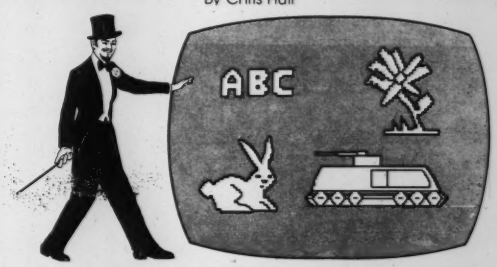

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formation, enabling the programmer to insert lower case within strings. (Lower case could also be placed into a program proper, but such characters will either be changed into upper case, or rejected by the Basic editor.) Of course your monitor screen will not show lower case unless you have modified your Apple by adding a lower case character generator of some sort. But, the feature can be used for text intended to be printed on a printer with lower case.

And that about finishes *Program Line Editor*. Except that Mr. Konzen has given us "overfull" measure for our money. He also added an Escape Create feature that enables each Apple owner to create macros which, in effect, enable special function keys. For example, after I load PLE, (it is part of the HELLO program on the system disk I usually boot with) I can type in the sequence ESC 1 to display a CATALOG of the disk loaded into drive 1.

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But maybe I was too rash in my opening. *Program Line Editor* is *not* indispensible. It is possible in the Apple Basics without it. But just like central heating, electric refrigerators, and indoor plumbing, I would rather not be without it. And I am sure that after you try it, you won't want to get along without it, either. (Thanks Barry—CC.)

"He used to be a computer programmer..."

To Hex and Back—A Tutorial

Converting from one number base to another is a frequent requirement for programming applications. When you use PEEKs and POKEs you need to convert from hex (base 16) to decimal (base 10). Programs to POKE machine language into memory and to dump the contents of memory are examples of practical applications. We will discuss a useful POKE program later, but first, let's consider the techniques for making the conversions.

Hex to Decimal

To convert from one system to another, it is first necessary to understand the nature of the systems. In the Apple, all the characters on the keyboard (and more that aren't available) are assigned codes. The code is known as ASCII—pronounced AS-KEY—which stands for American Standard Code for Information Interchange. There are other codes around, and IBM uses one of their own called EBCIDIC. But for anything we do within the Apple, the ASCII code is the only one with which we need to be concerned.

Get your Applesoft II Basic Programming Reference Manual and turn to page 138. Find the numbers 0 and 9 and observe that, in the DEC column, the value assigned is from 48 to 57. On the next page, find the letters A to F. The values assigned here are 65 to 70. Note that there are seven characters between the numbers and letters. Numbers 48 and 7 will be used in the conversions from one base to the other. These numbers are the differences between the code values, the positional values in the table, and the value of the characters we want to convert. Now, let's examine a program that uses these relationships.

Listing 1 is a short program to convert hex numbers to decimal. The program accepts a four-digit hex number, manipulates the digits, then sums the digits into the equivalent decimal number. Input is accepted in line 1000. There is no error checking included, so you will get funny results if you don't use correct characters. Then, a FOR...NEXT loop is set-up in lines 1010 to 1025. This loop steps through each of the four input characters and assigns the decimal value to the digit. First, the digit is converted to its ASCII value with the Applesoft string function ASC. Next, if the digit is a number, 48 is subtracted to put it into the range 0 to 9. If the digit is one of the letters A to F, an additional 7 is subtracted to put the value in the 10 to 15 range. Now we have the values stored in variables D(1) to D(4). Variable 1 is the most significant digit (MSD) and so on.

```
1000  INPUT "ENTER A 4-DIGIT HEX
      NUMBER - ";H$
1010  FOR I = 1 TO 4
1020 D(I) =  ASC ( MID$ (H$,I,1))
      - 48: IF D(I) > 9 THEN D(I)
      = D(I) - 7
1025  NEXT I
1030 D(1) = D(1) * 4096:D(2) = D(
      2) * 256
1040 D(3) = D(3) * 16:T = D(1) +
      D(2) + D(3) + D(4)
1050  PRINT : PRINT T
]
]
]
]RUN
ENTER A 4-DIGIT HEX NUMBER - FFFF
65535
]
]
]RUN
ENTER A 4-DIGIT HEX NUMBER - 9999
39321
```

Listing 1. Sample program showing use of FOR...NEXT loops in hex to decimal conversion.

In line 1030, each of the four variables is converted to its base 16 value. Position 1, the MSD, is 16 to the third power or 4096. Position 2 is 16 squared or 256. Position 3 is 16 to the first power or 16, and position 4 is the 1's position (16 to the 0 power). So each position is multiplied by its positional value and summed in line 1040. Line 1050 prints the results of all the manipulation. The output will be a five-digit number. Using the loop to break down (parse) the hex string makes this a compact conversion routine. Listing 3 is an example of how to do the same conversion without the use of FOR...NEXT loops.

Listing 3. Another way to convert hex to decimal requiring more coding than the example in Listing 1.

```
90  HOME
100  INPUT "INPUT A 4 DIGIT HEX N
     UMBER - ";A$
110  PRINT : PRINT
130  LET H1 =  ASC ( LEFT$ (A$,1)
     ) - 48
135  IF H1 > 9 THEN H1 = H1 - 7
140  LET H2 =  ASC ( MID$ (A$,2,1
     )) - 48
145  IF H2 > 9 THEN H2 = H2 - 7
150  LET H3 =  ASC ( MID$ (A$,3,1
     )) - 48
155  IF H3 > 9 THEN H3 = H3 - 7
160  LET H4 =  ASC ( RIGHT$ (A$,1
     )) - 48
165  IF H4 > 9 THEN H4 = H4 - 7
170  LET H1 = H1 * 4096
180  LET H2 = H2 * 256
190  LET H3 = H3 * 16
200  LET H = H + H1 + H2 + H3 + H
     4
210  PRINT : PRINT "$";A$;"  =  "
     ;H;"   DECIMAL"
```

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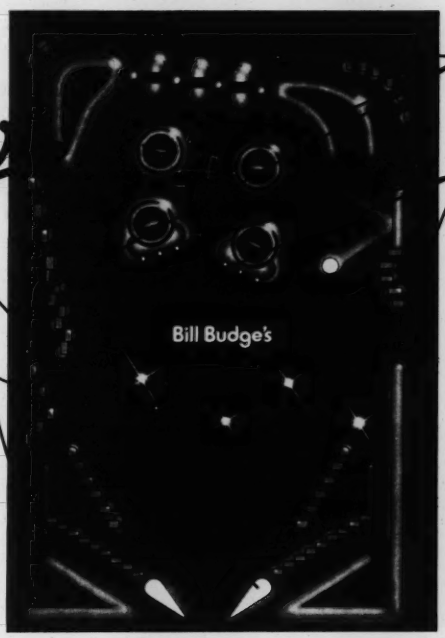

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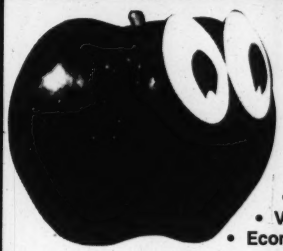

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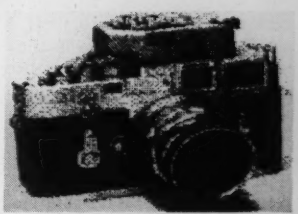

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CIRCLE 212 ON READER SERVICE CARD

```
1000  INPUT "ENTER 5-DIGIT NUMBER
      - ";H
1020  FOR I = 1 TO 4
1130 H1 =  INT (H / 16):D(I) = H -
     16 * H1:H = H1
1140  NEXT I
1150  FOR I = 4 TO 1 STEP  - 1
1155 H$ = H$ +  CHR$ (D(I) + 48 +
     7 * ((D(I) > 9)))
1160  NEXT I
1170  PRINT : PRINT "$";H$
]
]
]
]RUN
ENTER 5-DIGIT NUMBER - 65535
$FFFF
]
]
]RUN
ENTER 5-DIGIT NUMBER - 00100
$0064
```

Listing 2. Sample program showing use of FOR...NEXT loops in decimal to hex conversion.

Decimal to Hex

As you might expect, converting from decimal to hex is just the reverse of hex to decimal. Listing 2 is a short program that does this. Again, FOR...NEXT loops are used to minimize coding. Line 1000 accepts input of a five-digit base-10 number. As in the other example there is no error checking. The number should have five digits between 00000 and 65535. This is consistent with the range of memory addressable by the Apple 6502 microprocessor.

Line 1020 uses a loop to break the number into four elements representing the hex values. They are stored in four variables, D(1) to D(4).

Lines 1050 to 1060 are another loop to convert the digits back to their ASCII values. This is accomplished with the CHR$ string function. To complete the conversion, 48 is added to the value of the digit for the numbers. If it is a letter, an additional 7 is added. Note that line 1155 uses relational logic to test for the range of values. I was not able to make this work in line 1020 of Listing 1. The string H$ is built one character at a time until all four hex characters are accumulated (concatenated).

Line 1070 prints the string with the $ symbol at the front. In 6502 convention, the $ symbol is used to indicate a hex number.

All Together Now

Now that you understand how to make the conversions, a program is needed to put it all together. The program in Listing 4 is my example of a way to do it. Lines 1060 to 1160 set up a menu and the logic to make the selection. The hex conversion program is in lines 2000 to 2100. A couple of additional items were added.

```
1000  REM **********************
1010  REM PROGRAM TO CONVERT HEX
1020  REM  AND DECIMAL NUMBERS.
1030  REM  BY: CHUCK CARPENTER
1040  REM **********************
1060  HOME
1070  PRINT "SELECT OPTIONS"
1080  PRINT "-------- --------"
1090  PRINT
1100  PRINT "    1.   HEX TO DECI
     MAL CONVERSION"
1110  PRINT "    2.   DECIMAL TO
     HEX CONVERSION"
1120  PRINT "    0.   END THE PRO
     GRAM"
1130  PRINT
1140  PRINT "ENTER YOUR CHOICE ";
     : INPUT S
1145  IF S > 2 GOTO 1000
1150  IF S = 0 THEN  HOME : PRINT
     "END OF PROGRAM...": END
1160  ON S GOTO 2000,3000
1180  REM - ** HEX TO DECIMAL **
1190  REM    **********************
2000  HOME :H$ = "":T = 0
2010  INPUT "ENTER A 4-DIGIT HEX
     NUMBER...";H$
2020  FOR I = 1 TO 4
2030 D(I) =  ASC ( MID$ (H$,I,1))
     - 48: IF D(I) > 9 THEN D(I)
     = D(I) - 7
2040  NEXT I
2050 D(1) = D(1) * 4096:D(2) = D(
     2) * 256
2060 D(3) = D(3) * 16:T = D(1) +
     D(2) + D(3) + D(4)
2070  PRINT : PRINT H$" = ";T;" D
     ECIMAL"
2080  PRINT "MORE HEX CONVERSIONS
     Y/N ";: INPUT A$
2090  IF A$ = "Y" GOTO 2000
2100  GOTO 1000
2120  REM - ** DECIMAL TO HEX **
2130  REM    **********************
3000  HOME :N = 0:H$ = "":H = 0
3010  INPUT "ENTER A 5-DIGIT BASE
     -10 NUMBER...";H:N = H
3020  FOR I = 1 TO 4
3030 H1 =  INT (H / 16):D(I) = H -
     16 * H1:H = H1
3040  NEXT I
3050  FOR I = 4 TO 1 STEP  - 1
3060 H$ = H$ +  CHR$ (D(I) + 48 +
     7 * ((D(I) > 9)))
3070  NEXT I
3080  PRINT : PRINT N;" = $";H$;"
      HEXADECIMAL"
3090  PRINT "MORE HEX CONVERSIONS
     Y/N ";: INPUT A$
3100  IF A$ = "Y" GOTO 3000
3110  GOTO 1000
```

Listing 4. Menu driven program to convert hex and decimal numbers. Combines examples of Listings 1 and 2.

The variables are zeroed in line 2000, and the ability to go back and do it over is included in lines 2080 to 2100. Decimal conversion in lines 3000 to 3110 includes the same additions. Note that there is still no error checking in the program.

You could test for the number of input characters for instance. You could also test to see if they are in the correct range. As they say in the text books, I'll leave this as an exercise for the reader.

```
1  GOSUB 5000
2  GOSUB 6000
3  END
5000  REM - ENABLING CLOCK
5010  FOR I = 768 TO 775: READ A$

5020 D1 =  ASC ( LEFT$ (A$,1)) -
     48
5030  IF D1 > 9 THEN D1 = D1 - 7
5040 D2 =  ASC ( RIGHT$ (A$,1)) -
     48
5050  IF D2 > 9 THEN D2 = D2 - 7
5060 D1 = D1 * 16:T = D1 + D2: POKE
     I,T
5070 T = 0: NEXT I: RESTORE
5080  RETURN
5090  DATA  A9,C4,85,39,20,00,C4,
     60
6000  REM - READING CLOCK
6005  CALL 768
6010  POKE 651,58: POKE 648,58
6020  FOR I = 653 TO 646 STEP  -
     1
6030 A$ =  CHR$ ( PEEK (I))
6040  PRINT A$;: NEXT I
6050  PRINT : RETURN
]
]
]RUN
08:01:55
```

Listing 5. Program example to demonstrate one technique to convert hex data to decimal and POKE the result into a memory location within a program.

Making it Work

Having a program to make these conversions is kind of fun. But as a more practical matter, you can't use them at the same time you're writing another program. You would need to do the conversions first, then use them in your program as you write it. Since the most usual case is to convert hex to decimal, an example of a program using the conversion is appropriate. The Mountain Computer Clock in my computer requires machine language to initialize it and generate the clock output. Since the machine language is in hex, it is easier to let the program do the conversion to decimal for the POKE statements. Listing 5 is an example of a program that will do this. Note that in this program only two digits are to be converted. The FOR...NEXT loops used in the examples would take too much code here, so each digit is converted separately. The program is really two subroutines. Lines 1, 2 and 3 are used to call the routines to first, enable the clock and second, to read the clock output.

The machine language program is going to be POKEd into page 3 of memory, decimal locations 768 ($300) to 775. A READ...DATA combination is used to store and recall the hex machine language code.

Line 5010 reads each byte of the data as variable A$. Each digit of the hex byte is converted to its ASCII value in lines 5020 to 5040.

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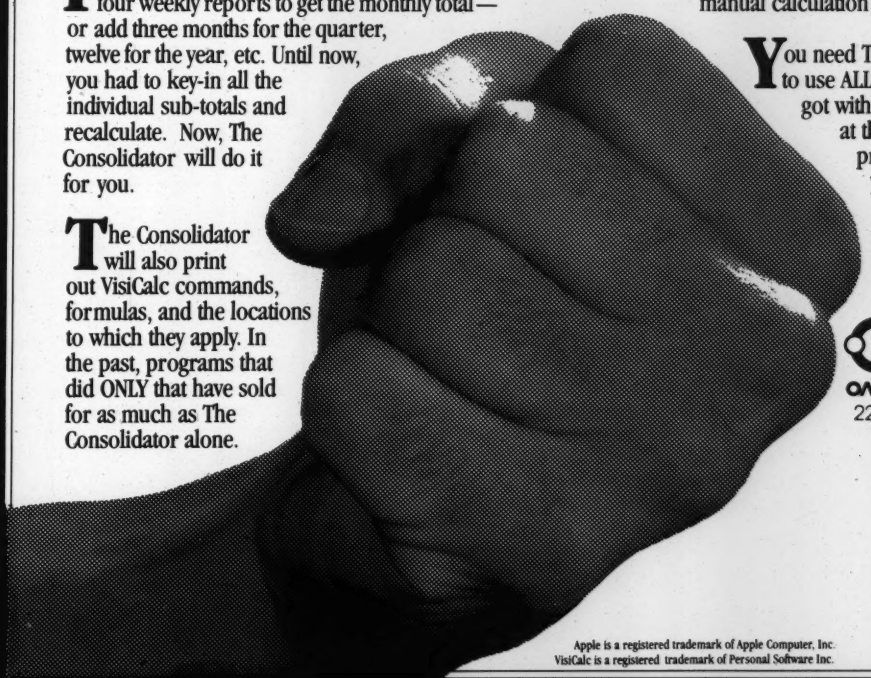

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CIRCLE 200 ON READER SERVICE CARD

```
]LIST
100  REM    HEX TO DECIMAL
110  REM    BY: BILL VON BENKEN
120  REM
200 A$ = "0123456789ABCDEF": FOR
     B = 1 TO 16: FOR A = 1 TO 16
     : FOR C = 1 TO 16: FOR I = 1
      TO 16:W$ =  MID$ (A$,B,1):Z
     $ =  MID$ (A$,A,1):Y$ =  MID$
     (A$,C,1):X$ =  MID$ (A$,I,1)
     : PRINT W$;Z$;Y$;X$,N:N = N +
     1: NEXT : NEXT : NEXT : NEXT

]
```

Listing 6. Single line program to display hex numbers and decimal equivalents.

Listing 7. One liner randomly generates colorful flower patterns.

```
]LIST
10  REM  - FLOWERS
12  REM    BY: STEVEN WONG
14  REM
20 P = 3.14: HGR2 : FOR L = 1 TO
     30:A =  RND (1) * 219 + 30:B
      =  RND (1) * 131 + 30: HCOLOR=
     3: HPLOT A,191 TO A,B:H =  INT
     ( RND (1) * 7) + 1: HCOLOR=
     H - (H = 4):S =  RND (1) * 2
     0 + 10: FOR T = .5 * P TO 2.
     5 * P STEP 2 * P / S:X = A +
      SIN (T) * S:Y = B -  COS (T
     ) * S: HPLOT A,B TO X,Y: NEXT
     : NEXT : GOTO 20
]
```

Listing 8. Colorful snowflake patterns with the sound of falling snow are generated by this one liner.

```
]LIST
10  REM  - SNOWFLAKES
12  REM    BY: STEVEN WONG
14  REM
20 P = 3.14: HGR2 : FOR Z = 1 TO
     99:A =  RND (1) * 261 + 9:B =
      RND (1) * 173 + 9: HCOLOR=
      RND (1) * 7 + 1:C =  RND (1
     ) * 5 + 4: FOR T = .5 * P TO
     2.5 * P STEP 2 * P / C:X = A
      +  SIN (T) * C:Y = B -  COS
     (T) * C: HPLOT A,B TO X,Y:V =
      PEEK ( - 16336): NEXT : NEXT
     : GOTO 20
]
```

Line 5060 multiplies the digits by their weighted positional values, adds them together and POKEs the result into the current memory location I. When all bytes of data are converted and POKEd, the program is terminated in line 5070 and the data pointer is RESTOREd.

Next, the subroutine to read the clock output is called. This routine starts by CALLing the machine language program in page 3. Next the two POKEs put colons in two memory locations. This clock puts semi-colons in between the data in a loop. The data is stored in reverse order, hence the step of -1. Each character is converted to its ASCII value in line 6030 and printed in line 6040. Each character is printed in turn through the range of the loop. The memory range of the loop is at the end of page 2. This range is used by the keyboard as an input storage buffer. Since most of the space is not used by normal keyboard input, it can be used to advantage for temporary storage.

A program such as this example illustrates one possibility for conversion within the program. Another would be a memory dump program. For instance, you can enter the starting location directly in hex. Then, the program can do the conversion to decimal for the PEEKs at memory. Next you can have the program print both the hex and decimal values of memory locations being examined. You could also add the printable characters represented by the hex data. I recently wrote a program to do these things. A program like this in Basic is slow but very useful since it can be used to examine itself as well as all other memory locations. You don't need to exit from Basic to use a memory dump utility. But that's another story.

One Liners

Programs that are complete in one line have been part of past columns. These fun little programs have been mostly clever uses of graphics. This month, Listings 6, 7 and 8 include one that is not graphics and two that are. As I have cautioned before, type them very carefully. It is very easy to make a mistake. Listing 6 is appropriate (by coincidence) this month—it shows hex numbers and their decimal equivalents. The program comes from Bill Von Benken. The other two from Steven Wong generate attractive hi-res graphics patterns. If you have a one liner that you would like to contribute, please do. I'll include them in future columns.

Questions and Answers

About Integer Basic and Applesoft Basic: Recently, several letters have asked similar questions about the use of and the differences between the two main programming languages for the Apple. The original Apples had an Integer-only version of Basic as the only programming language available. Soon, however, the popularity of the computer demanded a language with more "power" in areas of number handling (floating point arithmetic as it is called) and the ability to handle text through string manipulation. Thus Applesoft was made available for the Apple II.

Integer Basic is quite a bit different from Applesoft in several ways. In addition to several commands and the implementation of them, the interpreter handles programs differently in memory. Integer Basic, as the name implies, uses only integers (whole numbers) in the range of plus and minus

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David Ahl, Founder and Publisher of Creative Computing

creative computing

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Text Files, continued...

32767. To use numbers outside this range, special programming techniques must be employed. In addition, the integer interpreter places the program in memory starting at high memory. Variables are stored from low memory up. The Applesoft interpreter, on the other hand, puts the program at low memory, the numerical variables at the end of the program, and the string variables from high memory down. Mainly because of the interpreter differences, you cannot run integer programs with Applesoft or the other way around.

Lately, some of the questions about these languages have included problems relative to the Language Card. There are programs on the masterdisk, which comes with the system, to load the non-resident language into the language card. For instance, if you have an Apple II, Applesoft will be loaded since Integer Basic is the ROM resident language. With the Apple II Plus, Integer Basic is loaded into the Language Card. If you have no language card, or you don't have one of the corresponding ROM cards, you can run only programs using the resident language in your machine. Again:

- Apple II has Integer Basic resident in ROM.
- Apple II Plus has Applesoft Basic resident in ROM.

To use (or have) both languages in the same machine, you need to add hardware/firmware. Slot 0 in the expansion slots is reserved for this purpose. You add an Integer card to the Apple II Plus. You add an Applesoft card to the Apple II. I have an Apple II and originally added an Applesoft card so I could use both languages. Applesoft became the more popular language so the Apple II Plus came about.

There is an alternative. This is where the programs INTBASIC (and FPBASIC) come into use (the ones on your master disk). You can also plug a 16K (or more) ROM card into slot 0. When you do this, the language that is not resident in ROM is loaded into the RAM card. The master disk will test for the presence of a RAM card and load the appropriate language (during the boot cycle).

If you have one of the ROM language cards in slot 0, nothing happens since the alternate language is already there. Note that to get all the available utilities, you need to have the alternate ROM card or the RAM card installed. Once you do this, you can do anything that it is possible to do with your Apple II.

Remember, you cannot directly run Integer Basic programs with Applesoft or the other way around. Indirectly, you can convert one to the other. But it's not a simple task. Several people including me (May '80) have written about making such conversions.

Next Time

Several readers have contributed short programs other than one liners (keep 'em short please). Some of them will be included next time. There will be more Questions and Answers too. Please write, I'm delighted to hear from you. And, to save time, write directly to me. □

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outpost: atari

This is Part 2 of the description of Atari disks begun in the April "Outpost: Atari."

David Small

Disk I/O is a very slow process for the Atari. The disk must be physically spun, which takes a while, and data must be shipped back and forth, which is even slower. The idea behind Atari's DOS is to minimize disk I/O. So we come to the concept of a "buffer."

In Atari's DOS, whenever you read or write to a file, you are reading/writing into a 128-byte reserved area in memory called a buffer. You are not writing to the disk at all. The Atari keeps the contents of one of the sectors of the disk in that buffer. So if you read/write to that buffer, the operation occurs at very high speed, which is what we want. For instance:

```
10 OPEN #1,4,0, "D1:FILE"
20 FOR A=1 TO 10000
30 GET #1,A
40 NEXT A
```

merely reads, byte by byte, 10000 bytes from disk. But if you run this program, you will note that the disk isn't being accessed continually; only every once in a while will you hear a beep to indicate another read. What happens is that the Atari opens the file and pulls the first sector full of data into the memory buffer. When you do the first 125 GETs, the bytes are pulled out of that memory buffer. Then you try to read another byte, but the Atari doesn't have that one in memory yet. So it requests the disk to send it the next 128 bytes, fills the buffer with those 128 bytes, and starts reading at the beginning of the buffer again.

David Small, 11314 Yucca Dr., Austin, TX 78750.

(If you are wondering why I said the 125th byte, it is because the Atari DOS reserves three bytes per sector for its own uses, which we will talk about later.)

Similarly, when you PUT # to a disk file, the Atari lets you PUT 125 bytes to the buffer, then dumps it to the disk, moves in another 125, and so on.

The result of all this confusion is that the Atari doesn't have to go to disk for every individual byte; rather, it stays in memory for a large number of "disk" accesses, and things run much faster.

When the Atari is LOADing or SAVEing a program, again it uses these buffers. The process is invisible to you, but you can hear the beep as each individual sector in the program is LOADed, or a clunk as a sector is SAVEd. Remember, the Atari can only talk to the disk in terms of complete 128-byte sectors.

Understanding the buffer is important in solving some of the mysterious problems that can occur while using the disk. For instance; let's say you write something out to the buffer, and then your program bombs. You examine the disk file, and find the data never reached the disk. This is because the buffer was never written to disk. If you didn't know about the buffer, you'd be wondering why the disk didn't record what you wrote to it.

The CLOSE Statement

The CLOSE statement is provided for this case. It makes sure that everything in the buffer gets to the disk. It also updates the directory, where all file names are listed.

The DOS program handling all this keeps a table of free sectors on the disk, by the way, and when the buffer fills up and a place is needed to store the 128 bytes, a sector number is taken from that table. When a file is deleted, its sectors are returned to that table. (The XXX FREE SECTORS message at the end of the DOS directory is determined by this).

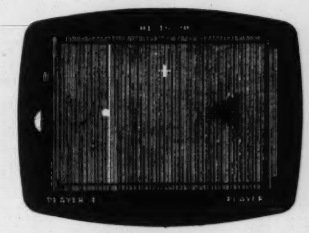
So much for Basic I/O. Everything done with Basic I/O is a version of the above; everything goes through the 128-byte buffer. How about DOS?

When you issue the COPY disk command from DOS, each sector of the file is sent to memory. In other words, DOS copies the contents of that file into memory, 128 bytes at a time. It then takes the file in memory and writes it out to disk, from memory, again in 128 byte chunks.

When you issue a Duplicate Disk command, DOS reads in every sector on the disk that is marked as "used" and stores it in memory. The unused sectors are ignored to save time. DOS then writes those used sectors out to the new disk, in the same position it found them on the old one, and doesn't worry about the empty sectors. Since there are 92,000 bytes on a disk, and only 48K maximum of memory, it may have to do this in smaller pieces—let's say 32K at a time. You then must physically change the disk several times on a single-drive system. If you are using a multiple disk system, you will see it do the copy in multiple stages.

Note: If you are copying disks for backups, remove any cartridge; each cartridge selects 8K of RAM and makes for more disk swaps.

Atari SOFTWARE



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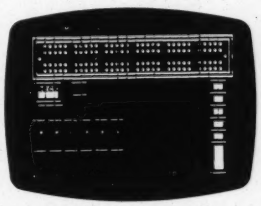

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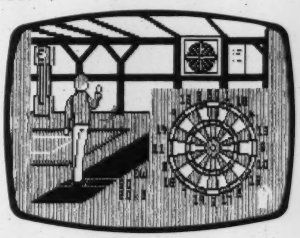

*Darts

Enter the pub, grab a pint of lager and a handful of darts, then try for a bull's eye in this amazing graphic game. One or two players can go at it, testing their aim at ten skill levels. Whether you want to throw a few, or just show your friends what the Atari computer can do, **Darts** is an ideal addition to your software library. This is Britain's most popular Atari game from Thorn/EMI. Order cassette CS-7011 $14.95.

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This program simulates coast-to-coast trips by an independent trucker hauling various cargos.

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In order to know what sectors are used, and what files are on the disk, some tables must be kept on that disk. The DOS reserves certain sectors on the disk for these tables. One is known as the VTOC (Volume Table of Contents) and is sector number 360. In it is a table of all 720 sectors on disk, stored as bit-map; i.e., one bit per sector. The disk directory is stored in sectors 361-368; this is the actual list of the file names and the sectors they occupy. To find a file, DOS must use this directory.

By the way, these reserved sectors explain why only 707 sectors are available on a "clean" disk; the rest are used for the directory tables, etc. You will also hear, during the disk formatting process, right near the end, the clunks as DOS writes out a fresh directory to the disk, after the disk 6507 has finished formatting it.

Remember, DOS at the lowest level, past all of the directory opens, XIO's, and so forth, is only doing get sectors/put sectors. Let's learn about those calls.

Get Sector/Put Sector Calls

All get sector/put sector calls rely on a table called the Device Control Block. Data is put into this table, and a jump is made into the operating system, which in turn uses that table. Table 1 is the disk table, starting at $300 (or 768 decimal).

One POKEs values into this table, and then does a JSR to DSKINV ($E453). DSKINV then does the requested operation and returns to you. Program 1 is a sample program that does the needed POKEs and requests from you a sector number (1-720) to read.

This program POKEs the DCB parameters, reserves 128 bytes in memory as a string for the buffer area, requests the sector number, then runs a very short assembly program which does a PLA, needed by Basic, then jumps off to DSKINV. DSKINV then does the operation, and returns to Basic.

There the status code placed in the table by DSKINV is printed, and the buffer area, as a string, is also printed. Sure, it will be strange, but you can examine individual bytes easily. If you read one of the directory sectors (try 361) you will see the directory entries.

If an 87 instead of an 82 were POKEd into DCOMND, then a Put Sector would occur ($57=Put Sector, $52=Get Sector). Then the contents of that buffer would be written to disk.

The status code will be a 1 if all goes well. If there is a problem, you may find a 144 as the error code. This Device Not Done Error occurs if the disk is bad, the disk is write protected, etc.

We have just done disk access the same way DOS does it, at the sector level. Note we have not done an OPEN or an XIO; we have directly accessed the disk. This can be handy if you have a need for a disk allocation scheme free of DOS; I use it to store directly fixed-length records. It is fast and efficient, and removes the DOS overhead.

Also, it enables you to access the directory and modify it as necessary; this allows you, for instance, to un-delete files.

Because we are not using DOS, but are still accessing the disk, we are not dependent on the DOS directory or "In-Use-Table." We can read or write any sector on the disk, regardless of what DOS thinks that sector is for. You may want to take note: This is how to write a "boot record," a special disk record that enables your disk to boot by itself, as so many games do. The boot record is record 1; see the hardware manual for further details.

Table 1.

0300 DDEVIC	—Serial Bus ID. Not used by user.
0301 DUNIT	—Disk number. 1-4.
0302 DCOMND	—Command Byte. This is: $21 Format Disk $50 Put Sector, without verify $52 Get Sector $53 Get Status $57 Put Sector, with verify
0303 DSTATS	—Disk Status. This is returned to you after the operation is done.
0304,0305	DBUFLO,HI. Buffer Address. This is a 16-bit address in memory that is the starting address of where to get or put 128 bytes.
0306	DTIMLO Disk Timeout Value. Leave it alone.
0308,0309	DBYTLO,HI Set by handler. Leave it alone.
030A,030B	DAUX1,DAUX2 Sector Number. Which disk sector, 1-720, to read/write.

Program 1.

```
5 REM SAMPLE PROGRAM TO DO DIRECT
6 REM DISK I/O. DAVID SMALL,12/21/81
7 REM
10 DCB=768:REM START OF DISK DCB
20 POKE DCB+1,1:REM DISK 1
30 POKE DCB+2,82:REM $52 = GET SECTOR
35 REM *** GET 128 BYTE OPEN BUFFER
40 DIM BUFFER$(128)
45 DIM CALL$(10)
50 FOR X=1 TO 128:BUFFER$(X)=" ":NEXT X
60 ADDR=ADR(BUFFER$)
70 ADDRHI=INT(ADDR/256)
80 ADDRLO=ADDR-(ADDRHI*256)
90 POKE DCB+4,ADDRLO:REM BUFFER ADR LOW
100 POKE DCB+5,ADDRHI:REM BUFFER ADR HI
110 REM *** SECTOR NUMBER ***
120 PRINT "INPUT SECTOR NUMBER"
130 INPUT SECTOR
140 SECTORHI=INT(SECTOR/256)
150 SECTORLO=SECTOR-(SECTORHI*256)
160 POKE DCB+10,SECTORLO
170 POKE DCB+11,SECTORHI
200 REM *** BUILD SHORT ASSY PROGRAM
210 REM *** OF  PLA, JMP DSKINV.
230 CALL$(1)=CHR$(104):REM PLA
240 CALL$(2)=CHR$(32):REM JSR
250 CALL$(3)=CHR$(83):REM $53
260 CALL$(4)=CHR$(228):REM $E4
270 CALL$(5)=CHR$(96):REM RTS
300 X=USR(ADR(CALL$))
310 DSTATS=PEEK(DCB+3)
320 PRINT "DISK STATUS=";DSTATS;" (1=OK)"
330 PRINT "DATA:"
340 PRINT BUFFER$
341 REM *** CLEAN OUT BUFFER$
342 FOR X=1 TO 128:BUFFER$(X)=" ":NEXT X
350 GOTO 110
400 END
```

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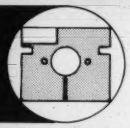

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Now that you can access the directory data directly, you can see all the data stored rather than just what OPENing "*.*" returns. A directory entry is 16 bytes long for each file. There are eight entries per sector in the directory, and eight directory sectors, hence 64 files maximum. See Table 2.

As an example of how the directory is used, if a file is LOCKed from DOS, all that occurs is that its flag byte has bit 5 set to 1.

When you delete a file, all that occurs is that the delete flag on the file is set. Then, next time DOS needs a place to put a new file entry, it knows it can overwrite the current entry.

Reading the Data into a File

In order to read the data in this file, one goes to the Starting Sector number found in the directory. Each sector contains information as shown in Table 3.

The "forward pointer" is where the next sector of the file can be found. It is a sector number from 1 to 720. When that next sector is read in, it in turn tells where the next sector can be found, and so on. This is called a "linked list" or chained sector scheme. This way, files don't have to be in any particular order on the disk (e.g., running continuously from sector 30 to 40). The sectors can jump around all over the disk, yet to DOS they are still linked together.

The file number is the file number in the directory. It is set to the same number as the entry number in the directory for all sectors. This is a safety measure. Let's say we are reading directory entry 6, and are going along, sector by sector. In the file number position in a given sector, we suddenly find a 13 (or whatever) instead of the 6 that should be there.

We know that the data for this sector has gotten scrambled, and the sector chain terminates there. This is an ERROR 164, which I am sure you have seen before; it is a warning that the data in this sector are likely to be bad. The sector link is also likely to be bad, so DOS normally stops an ERROR 164.

Reading in sectors one at a time, by getting the next sector number, reading, and so on, is called "sector tracing." Atari DOS does it every time it reads in a file. Atari also sells a "disk fix" program through their program exchange which uses the above information; you now know enough to use it. For instance, the forward "link" of a given section may be modified if desired.

We can do the same sector tracing out of Basic. We will find a given directory entry, read it in starting at the sector number given by the directory and proceed through each sector, with each new sector number obtained from the data in the previous one, until we have read in the number of sectors specified in the directory. Should anything be wrong (file number, etc.) we will know the file has gone bad.

Table 2.

Byte 1: Flag byte.

Bit 7 = 1 if this file has been deleted
Bit 6 = 1 if this file is in use
Bit 5 = 1 if this file is locked
Bit 0 = 1 if this file is OPEN.

Bytes 2,3. Sector Count; the number of sectors in the file, stored low, then high bytes.
Bytes 4,5. Starting Sector. Where the file begins (what sector number).
Bytes 6-16. File name. Last three bytes are the extension if you add one, otherwise they are blanks.

Table 3.

Byte 1 .. Data Byte 125 ..	
Byte 126	File Number (6 bits) and high two bits of "forward pointer"
Byte 127	Forward Pointer
Byte 128	Short Sector count .. indicates this sector not completely full.

Program 2 illustrates first how to read in the directory and interpret it, and second how to follow a sector chain for a given file. It reads in the directory, lists it to the screen, and asks which file to trace; if A is entered, all files will be traced (this takes a while). It will then trace the file through, stopping at any "broken links" or bad file numbers. It is an excellent way to check a disk which has some files going bad, and find out which ones are still readable and which aren't. After each check the program produces a directory listing showing which files are good, bad, or still unknown.

The techniques used within the program will probably prove more useful than the program; however, remember that this is an example. It can serve as the basis for custom disk inspect/modify routines if you wish to write them. Also, the program is written in MicroSoft Basic but translating it to the old Basic should be no problem at all. I highly recommend MicroSoft Basic in terms of speed and features as compared to the old Basic; an in-depth review of the Atari version of MicroSoft Basic will appear in an upcoming issue.

Sadly, the software pirate community also found out about direct disk I/O, literally years ago. Back then manufacturers were copy protecting disks by fouling up the directory and sector maps so that DOS couldn't perform the copy. With the advent of direct disk I/O, all these schemes were bypassed with what is known as a "sector copier."

As a side note, a sector copier is sometimes advertised as a "nibble copier" or "byte copier." This is an Apple term, and refers to individual bytes being read off the disk. It is completely inaccurate when applied to the Atari; all Atari disk I/O is in 128-byte blocks.

A sector copier, as you have guessed, just issues a read of all the possible sectors, then writes them.

Sector Copying

The program is simple to write now that you understand about sector I/O and how to call up DSKINV. It is just a matter of reading in 720 sectors and writing out 720 sectors. As I said, about 20 lines of Basic

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code are required. And now you understand why, as I mentioned last month, selling such a program, at the prices currently being charged, is such a ripoff.

But...how can a disk be protected against this sort of thing? Fortunately, there is a good way. Several software manufacturers hit on the same idea at the same time: bad sectoring. Let's assume we have a special disk, with some sectors on it that have never been formatted, as with the FORMAT DISK command. Most of them are OK; just a few are bad, as if there were holes in the disk. Now when the disk is told to read these sectors, it can't find them, for they were never formatted. So it returns an ERROR 144, instead of a normal return (1). Then, in the software on the disk, that sector is called, and if an ERROR 144 doesn't result, the program quits.

Let's say the program is then copied to another disk by an average sector copier. The "bad" spots on the disks will not copy; they will return ERROR 144, but on the destination disk, there will still be formatting information on those sectors. This is because the average Atari user cannot create a disk with bad spots in it; the FORMAT command is handled completely inside the disk by the disk 6507 microprocessor. The program will find that where it expected a bad sector, it now finds a good sector. Hence the program knows it is not residing on the original disk, and can quit.

The only way to defeat this scheme is to disassemble code and remove the sector check, and even if the author is slightly clever, it will take so long to find the sector checking routine that the program will be outdated by the time it is finally made copyable. Besides, consider what a person's time is worth compared to the cost of a program; if it takes two weeks to break a copy protection scheme, isn't it a better idea just to buy the program?

This bad-sectoring scheme works quite well in preventing a sector copier from being useful. Sure, a copy of the disk may be made, but without the bad spots on the disk, it will never run. And your average user cannot create these bad spots, for only access to the disk controller program allows that, and only very advanced users can accomplish this.

Atari currently uses this bad sector scheme in several of their disk-based programs. *Jawbreakers* uses the same scheme (hence the disk retry, or "snaaark," sound when you first boot it up). *The Wizard and The Princess* use it also. In other words, the move is toward this sort of protection.

Software manufacturers can probably figure out a way to write some bad sectors onto a disk. For instance, what popular personal computer gives you complete control over the disk read/write process? There are other ways, too.

Another manufacturer doesn't bother copy protecting his disks at all. However, a small module must be plugged into the front joystick port before the program will run. The module probably contains some sort of ROM-type circuit which is then read by the program through the PIA chip (joystick ports).

Well, we have covered a great deal, from piracy philosophy to sector chaining in these two columns. I hope you have enjoyed it and have learned something about the Atari disk, and how it really works. I also hope I have described some effective protection schemes for software manufacturers.

Direct disk I/O is a very powerful tool for Atari users; I hope you will use it to make your programs faster and more efficient. □

Program 2.

```
10 REM DISK CHECKER - DAVE SMALL
20 REM
30 GOTO 290
40 REM SUBROUTINES PLACED IN FRONT
50 REM FOR SPEED. NO COMMENTING.
60 REM
70 REM DISK READ SUBROUTINE--------
80 POKE DCB+1,DFROM
90 POKE DCB+2,82
100 BHI=INT(BUFF/256):BLO=BUFF-(BHI*256)
110 POKE DCB+4,BLO
120 POKE DCB+5,BHI
130 SHI=INT(RSECTOR/256):SLO=RSECTOR-(SHI*256)
140 POKE DCB+10,SLO:POKE DCB+11,SHI
150 X=USR(CALL)
160 DSTATS=PEEK(DCB+3)
170 RETURN
180 REM DISK WRITE SUBROUTINE-(SAMPLE)
190 POKE DCB+1,DTO
200 POKE DCB+2,87
210 BHI=INT(BUFF/256):BLO=BUFF-(BHI*256)
220 POKE DCB+4,BLO
230 POKE DCB+5,BHI
240 SHI=INT(RSECTOR/256):SLO=RSECTOR-(SHI*256)
250 POKE DCB+10,SLO:POKE DCB+11,SHI
260 PRINT "ERROR":GRAPHICS 0
270 DSTATS=PEEK(DCB+3)
280 RETURN
290 REM DISK CHECKER.
300 REM DOES SECTOR TRACE OF ALL
310 REM FILES IN THE DIRECTORY.
320 REM PRODUCES LISTING WITH OK/
330 REM BAD.
340 REM ASSUMES 48K, MICROSOFT.
350 REM
360 REM GET DISK NUMBER,WELCOME.---
370 GRAPHICS 0
380 CLEAR
390 PRINT "WELCOME TO SMALL'S DISK CHECKER."
400 PRINT "INPUT DRIVE NUMBER";
410 INPUT DF$
420 IF DF$="" THEN DFROM=1:GOTO 440
430 DFROM=VAL(DF$)
440 DTO=DFROM
450 CALL=&E453  !DSKINV ADDRESS
460 REM NOTE: MICROSOFT CAN CALL
470 REM DSKINV$ DIRECTLY, NO PLA
480 REM NEEDED.
490 DCB=&300
500 OPTION RESERVE 20*128
510 B=VARPTR(RESERVE)
520 IF B<0 THEN B=B+65536
530 REM FIRST, READ IN DIRECTORY----
540 PRINT "GETTING DIRECTORY."
550 INCR=0
560 FOR RSECTOR =360 TO 368
570 BUFF=B+(128*INCR)  !INPUT AREA
580 GOSUB 70        !GET SECTOR
590 IF DSTATS=1 THEN 630
```

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Atari, continued...

Program 2, continued.

```
600 PRINT "***DISK RETRY,DIRECTORY SECTOR ";RSECTOR
610 PRINT "***STATUS=";DSTATS
620 GOTO 570
630 INCR=INCR+1
640 PRINT INCR;
650 NEXT RSECTOR
660 PRINT
670 PRINT "WAIT -- BUILDING TABLES."
680 REM OK, NOW EXAMINE DIRECTORY.
690 REM PRODUCE LISTING FIRST OFF.
700 REM NOTE 360=VTOC, NOT DIR.
710 DIM INFO(64,6)   !FILE INFO
720 DIM NIME$(64)    !NAME INFO
730 DIM DEAD(64)     !FILE BOMBED?
740 FOR Z%=1 TO 64:DEAD(Z%)=0:NEXT Z%
750 REM
760 Z=B+128    !START OF  DIR ENTRY
770 REM BUILD FLAG & INFO TABLE------
780 FNUM=1
790 FOR LOC=Z TO Z+(64*16) STEP 16
800 REM LOC=ENTRIES' STARTING ADDR
810 FLAG%=PEEK(LOC)
820 IF(FLAG% AND &80)=&30 THEN INFO(FNUM,3)=1
830 IF(FLAG% AND &40)=&40 THEN INFO(FNUM,4)=1
840 IF(FLAG% AND &20)=&20 THEN INFO(FNUM,5)=1
850 IF(FLAG% AND 1)= 1 THEN INFO(FNUM,6)=1
860 REM SECTOR INFO-----------------
870 INFO(FNUM,1)=PEEK(LOC+1)+256*PEEK(LOC+2)
880 INFO(FNUM,2)=PEEK(LOC+3)+256*PEEK(LOC+4)
890 REM NOW GET NAME DATA..---------
900 NIME$(FNUM)=""
910 FOR Z%=5 TO 15
920 NIME$(FNUM)=NIME$(FNUM)+CHR$(PEEK(LOC+Z%))
930 NEXT Z%
940 REM CHECK FOR END OF ENTRIES
950 IF PEEK(LOC+5)=0 THEN 1020
960 REM
970 FNUM=FNUM+1
980 IF FNUM/5=INT(FNUM/5) THEN PRINT FNUM;
990 NEXT LOC
1000 PRINT "DIR TOTALLY FULL."
1010 GOTO 1030
1020 PRINT "DIR PARTLY FULL."
1030 FNUM=FNUM-1
1040 PRINT
1050 PRINT "NUMBER OF ENTRIES=";FNUM
1060 REM OUTPUT DIRECTORY
1070 REM ENTRY POINT (FROM BELOW)
1080 IF FNUM=0 THEN 1320 !EMPTY DISK
1090 PRINT
1100 PRINT "D=DELETED/U=USED/L=LOCKED/O=OPEN"
1110 PRINT "SC=SECTOR COUNT(LEN)"
1120 PRINT "SS=STARTING SECTOR"
1130 PRINT " + = GOOD FILE / - = BAD FILE / ? = UNKNOWN"
1140 PRINT
1150 FOR F=1 TO FNUM
1160 PRINT USING "##";F;
1170 IF DEAD(F)=-1 THEN PRINT "+";
1180 IF DEAD(F)=1 THEN PRINT "-";
1190 IF DEAD(F)=0 THEN PRINT "?";
1200 PRINT "!";NIME$(F);"!";
1210 IF INFO(F,3)=1 THEN PRINT "D"; ELSE PRINT " ";
1220 IF INFO(F,4)=1 THEN PRINT "U"; ELSE PRINT " ";
1230 IF INFO(F,5)=1 THEN PRINT "L"; ELSE PRINT " ";
1240 IF INFO(F,6)=1 THEN PRINT "O"; ELSE PRINT " ";
1250 PRINT "!SC:";
1260 PRINT USING "###";INFO(F,1);
1270 PRINT "!SS:";
1280 PRINT USING "###";INFO(F,2)
1290 IF F/20=INT(F/20) THEN INPUT RET$
1300 NEXT F
1310 GOTO 1390
1320 PRINT "EMPTY DISK -- NO ENTRIES"
1330 STOP
1340 PRINT
1350 REM ENTRY POINT (BELOW)
1360 PRINT "PRESS RETURN."
1370 INPUT RET$:CLS:GOTO 1420
1380 GOTO 1400
1390 PRINT "PRESS RETURN."
1400 INPUT RET$
1410 REM NEXT IS ENTRY POINT
1420 PRINT "SELECT :
1430 PRINT "1. A FILE NUMBER TO CHECK;"
```

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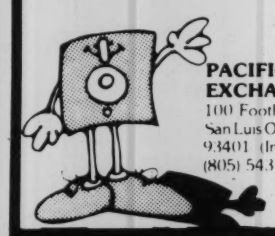

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Atari, continued...

Program 2, continued.

```
1440 PRINT "2. 'A' TO CHECK ALL FILES;"
1450 PRINT "3. 'D' TO SEE DIRECTORY LIST AGAIN"
1460 PRINT "NOTE: ERRORS SHOW UP ON DIR LISTING "
1470 PRINT "AFTER THEY OCCUR IN SEARCH."
1480 INPUT N$
1490 IF N$="A"  THEN FILE=128:GOTO 1630
1500 IF N$="D" THEN GRAPHICS 0:GOTO 1070
1510 ON ERROR 1540
1520 FILE=VAL(N$)
1530 GOTO 1560
1540 PRINT "ERROR. RE-ENTER."
1550 RESUME 1420
1560 REM --- PROCESS. CHECK.
1570 IF FILE>FNUM OR FILE<0 OR FILE<>INT(FILE)
     THEN PRINT "ERROR.":GOTO 1420
1580 REM SINGLE ENTRY HANDLER
1590 PRINT "TRACING--'SELECT' TO ABORT."
1600 SS=INFO(FILE,2) ! STARTING SECT
1610 SC=INFO(FILE,1) ! SECTOR COUNT
1620 RSECTOR=SS
1630 REM GO TRACE IT...ARROR=RETURN
1640 GOSUB 1850
1650 IF ARROR=1 THEN PRINT "***BAD FILE***"
1660 IF ARROR=1 THEN DEAD(FILE)=1 ELSE DEAD(FILE)=-1
1670 GOSUB 2110      ! MARK FILE NAME
1680 GOTO 1350
1690 REM ALL ENTRIES HANDLER
1700 FOR FILE=1 TO FNUM
1710 CLS
1720 PRINT "TRACING FILE #";FILE
1730 IF LP=1 THEN PRINT #3,"TRACING FILE #";FILE
1740 PRINT "PRESS 'SELECT' TO ABORT."
1750 SS=INFO(FILE,2) ! STARTING SECT
1760 SC=INFO(FILE,1) ! SECTOR COUNT
1770 RSECTOR=SS
1780 GOSUB 1850
1790 IF ARROR=1 THEN PRINT "***BAD FILE***" **"

1800 IF ARROR=1 THEN DEAD(FILE)=1 ELSE DEAD(FILE)=-1
1810 GOSUB 2110
1820 NEXT FILE
1830 PRINT "COMPLETED."
1840 GOTO 1350
1850 REM TRACING SUBROUTINE
1860 ARROR=0
1870 PRINT
1880 PRINT "---SEC CNT=";SC;" READING SEC ";RSECTOR
1890 POKE &D01F,0     ' CLEAR BUTTONS
1900 GOSUB 70         'READ
1910 REM CHECK  BUTTONS
1920 IF PEEK(&D01F)<>7 THEN RETURN
1930 IF DSTATS=1 THEN 1960
1940 PRINT "***ERROR. DSTATS=";DSTATS;" ON SECTOR ";RSECTOR
1950 GOTO 1900        'RETRY
1960 IF SC=0 THEN  RETURN
1970 SC=SC-1          ! DECR S COUNT
1980 REM GET FORWARD POINTER + FNUM
1990 FWD=(PEEK(BUFF+125) AND 3)*256
2000 FWD=FWD+PEEK(BUFF+126)
2010 FN=INT((PEEK(BUFF+125) AND &FC)/4) ! HENCE,
     SHIFTED 2 BITS RIGHT
2020 FN=FN+1   ! (DISK STARTS AT 0)
2030 PRINT "---DATA: FILE NUM=";FN;"  FWD SEC =";FWD
2040 IF FN<>FILE THEN PRINT "FILE NUMBER ERROR.":ARROR=1
2050 IF FWD>720 OR FWD<0 THEN PRINT
     "FORWARD PTR OUT OF RANGE,ABORT.:ARROR=1:RETURN

2060 IF FWD=0 THEN 2090
2070 RSECTOR=FWD
2080 GOTO 1870
2090 PRINT "COMPLETED."
2100 RETURN
2110 REM MARK A FILE AS BAD IN NAME.
2120 REM SET HIGH BIT SO IT SHOWS
2130 REM UP IN INVERSE VIDEO..
2140 IF ARROR=0 THEN RETURN
2150 Z$=NIME$(FILE)
2160 NIME$(FILE)=""
2170 FOR Z=1 TO LEN(Z$)
2180 NIME$(FILE)=NIME$(FILE)+CHR$((ASC(MID$(Z$,Z,1))
     OR &80))  !SET HIGH BIT
2190 NEXT Z
2200 RETURN                                          □
```

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Will Fastie

I have my system now, you know.

Well, what I mean to say is that I've run out of anecdotes about why I don't have a computer. It was great, like having automatic material. I guess I'll have to work at it from now on.

The topic of this column is the IBM (aka Epson) printer. I had promised a discussion of displays too, but that will have to wait until next month. There is enough, surprisingly, to say about the printer. It may seem strange to devote almost an entire IBM column to a printer which is obviously in broader distribution, but it is, after all, the "IBM" printer, the printer a great many owners of the Personal Computer are likely to have. Before we get rolling, though, there are a few administrative announcements.

I thank all of you who have gotten in touch with me. The information you have provided has been very useful and I have enjoyed your letters. Let me remind you that I cannot reply unless you supply a self-addressed, stamped envelope. With the SASE, I'll get back to you as soon as I can.

User groups are beginning to spring up for the IBM Personal Computer. I will be happy to carry an announcement of your group's formation in these pages. I would also like to ask that you include me on your mailing list for newsletters. Obviously, I can't afford to pay the dues for every group, but I'd sure like to hear about what you learn.

Reminder to vendors: I'm a black hole when it comes to announcements of new product, both hardware and software. I've been doing pretty well so far in getting such information, but your help will be appreciated. If you work for a firm that makes something for the IBM, let your marketing department know I exist.

W.H. Fastie, 7110 Sheffield Rd., Baltimore, MD 21212.

Disks!

I really got excited the other day. An evaluation disk from VR Data Corporation arrived in the mail. I had been limping along on one disk drive, and I was really looking forward to having two drives, if only for two weeks. I'm going to buy the drive, though, because I can't bring myself to disconnect it, much less send it back. The price is only $265, a bargain by comparison with IBM's price of $570.

The disk arrived via UPS, and was packed rather well. It was marked on the outside as "Drive B" and had been setup by VR Data for connection to the IBM. Installation of the drive was simple, and I got it working rather quickly.

Ah, you say, why not immediately? There was one problem, which you should be alert for. There are two DIP sockets on the electronics board on the drive. One of these is used for a terminator chip, and the other is used for jumpers.

On the IBM drive in my system, the terminator (referred to by IBM as the "pluggable module") is installed, and there is a wire jumper across one pair of pin sockets in the DIP socket.

On the drive from VR Data, there was no terminator, which is correct, but the jumper DIP socket had what is known as a "DIP shunt." This is nothing more than a DIP package with fuse-like shunts connecting directly opposite pins.

The "shunts" can be broken or left in place to create a set of jumpers in a single package. In the case of the VR Data drive, the DIP shunt was configured correctly but installed incorrectly.

Since no instructions had been delivered with the drive, I had to do a little detective work to discover this. Once I got the shunt installed so that the jumpered part of the socket matched that on my IBM drive, everything worked just fine.

I called Warren Rosenkranz (my face is red—I misspelled his name last month), the president of VR Data, to ask him about the lack of instructions and the shunt. He said that VR Data usually does pack installation instructions with drives sold to individuals, but often do not when they sell to computer stores, a large part of their business. I was put in the latter category.

As for the shunt, VR Data tests all their drives before they ship. The test equipment requires the shunt to be placed differently, and sometimes it doesn't get put back. Warren told me that they are usually very careful about everything, but that they have been deluged with orders for IBM expansions and have been very busy.

I like everything to have neat ends, but in this case I think the inconvenience was small considering the price I'm going to pay for the drive!

If you buy from VR Data, or any other supplier, make sure you specify which drive you are buying and that you expect instructions. If you already have one drive, the insert for your IBM Guide to Operations will have very good installation instructions. If you have bought only the disk adapter from IBM and are getting the drives elsewhere, you will need the instructions. The IBM Diskette Adapter includes the signal cable, and the installation procedures for it includes a picture of the cable showing which connectors go where.

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IBM continued...

Once the drive is installed, you must set the switches on the system board to reflect the number of drives installed. If you have an IBM drive, your IBM installation procedures will show how the switches are to be set. If you don't, the switch settings are also shown in the installation procedures for the display adapters, either the Monochrome or the Color/Graphics.

A word of warning. Although the diskette drive I got from VR Data is precisely the same Tandon drive used by IBM, it is still a foreign device in the eyes of IBM. This means they might not, and probably will not, be willing to service it. A computer store will usually be more flexible (pun intended) about service.

The IBM Printer

At first glance, it seems silly for me to write about the IBM printer. The Epson MX80 has been written about quite often, and is very much a known entity.

That's what I thought until I tried to write the program shown in Listing 1. I wanted this program primarily to print paginated listings of Basic programs, because neither Basic nor DOS provides this function. When a program is LLISTed, the printing begins wherever the paper is and continues right over page boundaries. I'm going to have quite a few listings around so I want them pretty and identifiable.

Listing 1.

```
10 REM PRINTER
20 REM Program to deal with the IBM 80 CPS Printer (Epson MX80)
30 REM Functions:  Setup printer modes
40 REM             Print paginated listings of text files
50 REM             Issue controls to printer
60 REM Author:    Will Fastie
70 REM Created:   12 Dec 1981
80 REM Edited:    26 Jan 1982  2355
90 REM Source:    PRINTER.BAS
100 REM Note:     Operates on current display device, current mode
110 REM ***** Constants
120 PROG$ = "PRINTER  v1.01  26 Jan 1982"
130 ESC$=CHR$(27)
140 CLRLPT$=CHR$(18)+CHR$(20)+ESC$+"F"+ESC$+"H"
150 PWIDTH=80
160 REM ***** Initial Menu
170 KEY OFF: CLS: SCREEN 0,0,0
180 PRINT PROG$: PRINT
190 PRINT "The printer must be ONLINE to"
200 PRINT "perform these functions."
210 PRINT
220 PRINT "Functions:";
230 PRINT TAB(13);"P - Print a text file"
240 PRINT TAB(13);"S - Setup printer"
250 PRINT TAB(13);"R - Reset printer"
260 PRINT TAB(13);"T - Advance paper to top"
270 PRINT TAB(13);"Q - Quit (return to DOS)"
280 PRINT TAB(13);"X - Exit to Basic"
290 MENSEL = CSRLIN+1
300 PLOC = MENSEL: GOSUB 1270
310 INPUT "   Enter function:  ",X$: IF X$="" THEN BEEP: GOTO 300
320 GOSUB 1210
330 X = INSTR("PSRTQX",X$): IF X = 0 THEN BEEP: GOTO 300
340 ON X GOSUB 360, 770, 1080, 1120, 1150, 1180
350 GOTO 160
360 REM ***** Print paginated listing
370 CLS
380 PRINT PROG$: PRINT
390 PRINT "Adjust the paper in the printer so that"
400 PRINT "the perforation is at the paper bail."
410 PRINT "Put the printer ONLINE."
420 PRINT
430 PRINT "Files MUST be ASCII text files."
440 PRINT
450 PRINT "No filename extension is assumed,"
460 PRINT "so enter the filename exactly."
470 PRINT "Depress ENTER key to return to menu."
480 PRINT "Press ESC key to abort printing."
490 PRINT
500 INPUT "File to print:  ",X$
510 IF LEN(X$) = 0 THEN RETURN
520 GOSUB 1210
530 WIDTH "lpt1:",PWIDTH
540 OPEN X$ FOR INPUT AS 1
550 PAGENR = 0
560 LINENR = 1
570 IF EOF (1) THEN 650
580 LINE INPUT #1, L$
590 IF LINENR = 1 THEN GOSUB 690
600 LPRINT L$
610 IF INKEY$ = ESC$ THEN 650
620 LINENR = LINENR + INT((LEN(L$)+79)/80)
630 IF LINENR > 54 THEN LINENR = 1
640 GOTO 570
650 REM Close file and return
660 CLOSE
670 GOSUB 1120
680 GOTO 500
690 REM ***** Subroutine to print page heading
700 IF PAGENR <> 0 THEN LPRINT CHR$(12);
710 PAGENR = PAGENR + 1
720 LPRINT: LPRINT
730 LPRINT CHR$(14);X$;" ";CHR$(20);
740 LPRINT "-- printed on ";DATE$;" at ";TIME$;" -- Page";PAGENR
750 LPRINT: LPRINT
760 RETURN
770 REM ***** Setup Printer
780 CLS: PRINT PROG$
790 PRINT: PRINT "Printer enhancements are:"
800 PRINT
810 PRINT "     DW - Double Width"
820 PRINT "     C  - Compressed Print"
830 PRINT "     E  - Emphasized Print"
840 PRINT "     DS - Double Strike"
850 PRINT
860 PRINT "Enter enhancements separated by spaces."
870 PRINT
880 PRINT "Examples:"
```


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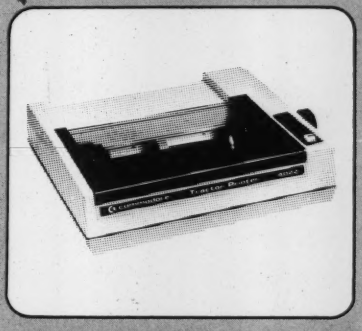

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IBM, continued...

```
890 PRINT
900 PRINT "  C E      - Illegal"
910 PRINT "           - 10   cpi, normal"
920 PRINT "  E        - 10   cpi, bold"
930 PRINT "  DS C     - 16.5 cpi, double"
940 PRINT
950 INPUT "    Enter enhancements:  ",O$
960 X$=O$: GOSUB 1210: O$=X$
970 LPRINT CLRLPT$;
980 IF INSTR(O$,"DW") THEN LPRINT CHR$(14);
990 IF INSTR(O$,"C")  THEN LPRINT CHR$(15);
1000 IF INSTR(O$,"E")  THEN LPRINT ESC$;"E";
1010 IF INSTR(O$,"DS") THEN LPRINT ESC$;"6";
1020 PRINT
1030 PLOC=CSRLIN
1040 GOSUB 1270
1050 INPUT "Enter desired line width:  ",PWIDTH
1060 IF 1 > PWIDTH OR PWIDTH > 132 THEN 1040
1070 RETURN
1080 REM ***** Reset printer to defaults
1090 LPRINT CLRLPT$;
1100 PWIDTH=80
1110 RETURN
1120 REM ***** Form feed to printer
1130 LPRINT CHR$(12);
1140 RETURN
1150 REM ***** Return to DOS
1160 CLS
1170 SYSTEM
1180 REM ***** Exit to BASIC
1190 CLS
1200 END
1210 REM ***** Subroutine to UPPERFY a string (in X$)
1220 FOR X = 1 TO LEN(X$)
1230   XC$ = MID$(X$,X,1)
1240   IF "a" <= XC$ AND XC$ <= "z" THEN MID$(X$,X,1) = CHR$(ASC(XC$)- 32)
1250 NEXT X
1260 RETURN
1270 REM ***** Subroutine to position at specified line and clear it
1280 LOCATE PLOC,1
1290 PRINT STRING$(40," ");
1300 LOCATE PLOC,1
1310 RETURN
1320 REM ***** Subroutine to wait for any keystroke
1330 PRINT "Depress any key to continue...";
1340 GOSUB 1360
1350 RETURN
1360 REM ***** Subroutine to get a keystroke into x$
1370 X$ = INKEY$
1380 IF X$ = "" THEN 1370
1390 RETURN
```

My problem was one of poor (yes, poor) documentation. All the facts are in various IBM documents, but not in one place, and not accurately. The Basic manual, in the LPRINT section, has an example of how to get the various styles printed, but no chart or explanation. The Guide to Operations has a chart, but it is very misleading, and if you do what it says some of the functions will not work. The Technical Reference Manual is the only one with completely accurate information, but even it is difficult to decipher and there are a few facts missing.

The problem with the chart on pages 3-15 of the Guide to Operations is obviously typographical in nature. The chart has the correct control codes, but it is annotated with either one or two asterisks(*). One asterisk is supposed to mean that the code should have 128 added to it to "make it work reliably." The only code to which this really applies is carriage return (CR), and then only in special situations. The IBM chart marks 12 codes this way. Two asterisks are supposed to mean that the code is to be preceded by the escape code, ASCII 27. None of the codes so marked in the IBM chart requires the escape.

The information you really need is embedded in the program and is also shown in Table 1. There are two rules which can generally be applied. If the ASCII control

Table 1. IBM Printer Control Codes.

If the entry is marked with an asterisk (*), the code must be preceded by the escape code (ASCII 27). The "Char" column shows those codes which are printable characters.

Code	Char	Function
0		Terminates Tab set functions
0		Set line spacing to 1/8" (Esc A)
1		Set line spacing to 7/72" (Esc A)
2		Set line spacing to current default, or 1/6"
7		Sounds buzzer in printer
10		Line Feed
11		Vertical Tab
12		Form Feed
13		Carriage Return
14		Turn on Double Width mode
15		Turn on Compressed Character mode
17		Selects printer
18		Turn off Compressed mode
19		Deselects printer
20		Turn off Double Width mode
24		Cancels unprinted data. Resets Double Width and Compressed modes
27		Escape
*65	A	Set line feed spacing
*66	B	Set vertical tabs
*67	C	Set form length (default = 66)
*68	D	Set horizontal tabs
*69	E	Turn on Emphasized mode
*70	F	Turn off Emphasized mode
*71	G	Turn on Double Strike mode
*72	H	Turn off Double Strike mode

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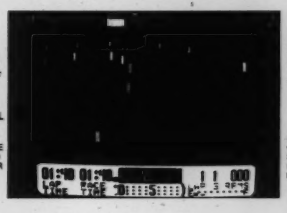

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Listing 2a.

```
100 ' Program to demonstrate embedded print attributes
110 ESC$ = CHR$(27)
120 CR = 13
130 NORMAL$ = "Normal Print"
140 DASHES$ = " -- "
150 NLEN = LEN(NORMAL$) + LEN(DASHES$)
160 X$ = "Bold Print"
170 'Print normal text, leaving space for emphasized part
180 LPRINT NORMAL$;DASHES$;SPC(LEN(X$));DASHES$;NORMAL$;
190 LPRINT CHR$(128+CR);       'command printer to print, no line advance
200 LPRINT ESC$;"E";           'turn on emphasis
210 LPRINT SPC(NLEN);X$        'space over to hole, print text while emphasis on
220                            'NOTE:  TAB won't work above!
230 LPRINT ESC$;"F";           'turn off emphasis
240 LPRINT: LPRINT
250 X$ = "Double Width"
260 'Double width printing is easier!
270 LPRINT NORMAL$;DASHES$;CHR$(14);X$;CHR$(20);DASHES$;NORMAL$
280 END
```

Listing 2b.

```
Normal Print -- Bold Print -- Normal Print

Normal Print -- Double Width -- Normal Print
```

code you are sending is in the range 0 to 31, then the code does not need to be preceded by the escape code. If the ASCII code is a printable character, then it must be preceded by the escape.

Another thing I tripped over was combinations of the printing attributes. I did not realize at first that certain combinations of attributes were not legal. For example, it is not possible to have compressed characters that are emphasized. If you try it, the characters will be compressed but not emphasized. It is also not possible to imbed any style within another, so you cannot print a line with normal print and emphasize a single word within the line. It is possible to imbed double width characters.

Also, the double width mode is automatically turned off at the end of each line.

I was a little angry that the printer would not handle embedded emphasized words in a simple way. It is possible to do this, but it is complicated. What you have to do is print the line, leaving blank space for the word to be emphasized. At the end of the line, print a carriage return *with 128 added to it*. Then turn on emphasized mode, print enough spaces to position to the blank spot, print the word, and turn off emphasized mode. The whole process is shown in the short program in Listing 2a and the result in Listing 2b.

There is one feature of the PRINTER program which requires comment. After the program prompts for the printing attributes, it asks for the width of the lines to be printed. The reason for this is twofold. First, you must specify the width depending on the type style chosen. Second, there is a problem with Basic statements that are longer than 80 characters. Microsoft Basic allows statements to "wrap" at the end of the line and extend onto the next line.

These lines will also wrap when printed. They will wrap at a different spot, however, if the print line is longer. For example, if the line is 90 characters long it will wrap on an 80-column display or when printed with the normal type style. If the same line was printed using compressed type and a line width of 132 the line will not wrap. So far, so good.

Microsoft Basic also allows statements to be "prettyprinted" on multiple lines. For the IBM version, this is accomplished by depressing Ctrl Enter instead of just Enter at the end of the line. Additional characters can be typed and will be part of the previous line. These are referred to as logical and physical lines, the logical line being a collection of physical lines.

The IBM Basic will allow logical lines up to 255 characters long, but the spaces at the end of each physical line are included in that count, so three physical lines is the effective limit.

Now if these lines are built on an 80-column display and printed in 80-column mode, the printing will be fine. But if they are printed in 132-column mode, the prettyprinting is lost. I like the way Basic on the Radio Shack Model II works better, because the spaces at the end of the line are not included in the count and nice looking IF-THEN-ELSE statements can be built.

Friction Feed

As you might imagine, my work for this column involves a significant volume of correspondence. For this reason, it is highly desirable for me to be able to use my system as an electronic typewriter. Emphasized print delivers an acceptable, so-called "correspondence quality" font.

The problem with correspondence on the IBM printer is its inability to feed a single sheet of paper. Epson markets a version of the MX80 called the "F/T," which allows both variable width, tractor driven, continuous forms and friction driven, single sheets to be used. The F/T option is not, to the best of my knowledge, available as a later add-on option to a standard MX80. There is, however, a kit available from someone else.

The MX80/MX70 Friction Feed Kit first appeared in advertisements for the Orange Micro printer stores. As I understand it, the manufacturing rights to the device were sold to a firm named CompuCable Corporation. CompuCable is building the device and selling it on an OEM basis (i.e., to others who will resell it). Bill Lehman and Dennis Glende of CompuCable sent me one of the kits to try out.

I am very impressed with this kit. It is a very clever design and it seems well built. The kit includes very good instructions with excellent photographs and a couple of special hex wrenches that are needed to install the platen.

According to CompuCable, the kit installs in about 30 to 45 minutes, depending on your mechanical aptitude. Best of all, the kit can be removed and the printer restored to original condition in about 15 minutes, and it can be re-installed in about 15 minutes.

I am relatively apt mechanically, I had all the tools specified in the instructions, and the installation took me about an hour. Everything was very easy, especially with the photographs, but one part of the job is very difficult.

There is a pair of springs on the paper bail that is too weak to support the rollers which come with the kit and are mounted on the bail. These springs are not strong

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IBM, continued...

enough to provide the pressure required to get a reliable friction feed. The kit includes two springs which are much, much stronger.

The installation of the kit required the removal of the weak springs (easy) and the addition of the new springs (tough). After a couple of tries I got the left spring on, but the right one, for a right-handed person, was very difficult. If the kit is ever removed, the springs can remain, and switching back and forth is simpler than the initial installation.

There is only one flaw in this kit, and that's in the instructions. Point number 1 reads "Remove the top housing cover of your printer as described in the Users Manual." Well, the IBM documentation does not tell you how to remove the top cover. I guess the Epson document does. Here are the steps you need to follow.

Disconnect the power cord and the data cable. Pull the platen knob straight off the end of the platen shaft. Remove the top cover, the ribbon, and the paper guide. Turn the printer upside down. Remove the four screws in the recessed holes at each corner.

Carefully turn the unit back over without dislodging the top housing cover. Lift the housing off by tilting it toward the front. Disconnect the cable that leads to the button and indicator panel. Put the cover aside, and you are ready to install the kit. Reverse this procedure to put the printer back together.

Once this kit is installed, single sheet paper will feed reliably with a minimum of skew. The top six or seven lines on the page cannot be printed, since they must be advanced so that the paper engages between the rollers and the platen. Continuous forms are restricted to 9 1/2" paper with standard tractor holes.

The kit is available from Orange Micro for $75. If you've purchased the IBM printer, or already own an Epson, and you want to use stationery or other cut sheets, I think this kit is worthwhile. Incidentally, I was told, either by CompuCable or Orange Micro, that installation of this kit is approved by Epson and will not void the warranty. I don't know what IBM's position is, but I'm in the process of finding out.

Printer Stands

One problem you're likely to have with the IBM printer is finding a way to situate it so that paper feeds and stacks smoothly and neatly. This is the main reason that a printer stand is useful. IBM offers a very attractive stand for $55. It is nicely designed and is made of smoked plexiglass.

For less than half the price, however, you can get a practical, plexiglass stand from Programs Unlimited. Called "The Printer Solution," it sells for $24.95, and can be ordered with an optional factory-installed second paper shelf for an additional $9.95. I had hoped to have a photograph of the stand, but PU didn't come through.

One difference between this stand and the IBM stand is that you can see the paper in The Printer Solution. John Paysman, of Programs Unlimited, told me this was an advantage if you had more than one kind of paper because you could see what kind of paper is under the stand.

New Products

The Amdek Color-I and Color-II display monitors are being sold by the IBM Product Centers. I am astonished—I think this will be the only product carried by these stores that does not carry the IBM logo. These monitors are reasonably priced. The Color-I is an NTSC (composite video) device, while the Color-II is an RGB (direct drive) device. The Color-II is currently a seven-color monitor, but Amdek told me a 16-color version was on the way.

Quadram Corporation has announced expansion memory boards for the Personal Computer. They offer 64K, 128K, and 192K byte boards. They are unique in that they offer the 64K board with or without parity. Their prices are $395 for 64K (with parity), $595 for 128K, and $795 for 192K. The smaller boards are user-expandable to 192K. These prices are the lowest I have seen so far. I'll have better technical information next month.

This isn't exactly a new product, but I got my first issues of *SATN*, the Journal for VisiCalc Users, published by Software Arts, Inc. It is terrific! If you are using VisiCalc heavily, I think you will find this publication very interesting and useful. If Vol. 2 is any measure, you will find creative VisiCalc applications that should help you learn how to build your own complex solutions. In Vol. 2, there is a tutorial on how to solve crytarithms, like the famous SEND + MORE = MONEY problem. Who would have thought to use VisiCalc for that? It's mind-bending. Subscriptions are $30, but worth it.

Next month: Displays. □

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Chas Andres

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Sally Greenwood Larsen

Computer for Kids is written for the elementary level child fascinated by computers but frustrated by the reading level of adult programming books. Published in three editions, TRS-80, Apple and Atari, and written expressly for the young programmer-to-be, this delightful book features large, easy-to-read text, and complete instructions for operating and programming personal computers. *Computers for Kids* covers "everything you need to know" about programming in twelve chapters: How computers work; how to run, load and save programs on the computer; how to write flow charts; and how to program in BASIC. A glossary of statements and commands is included, as well as a special section for parents and teachers that offers valuable teaching techniques and lesson ideas including solutions to common hardware problems.

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rings...trs-80 strings...trs-8

Stephen B. Gray

As the ball drops into the 40 slot on the TRS-80 wheel, we see five chips on the gaming table. Because it's again time to live up to the column's name, we first take a long look at using strings, in ways that may be familiar to many of you, but ending with one that probably isn't. Then on to three Radio Shack products for the Pocket Computer: the printer and the *Games II* and *Civil Engineering* packages. We end with a short musical program for the Color Computer, thus completing a triple play.

Splitting Strings

There is a way of figuring out the location of an address on a Manhattan avenue by performing a simple mathematical operation on the number. You simply "cancel the last figure of the number, divide the remainder by 2, and add or subtract the given key number," according to the instructions found on the back of some New York business card.

To locate the Chemical Bank at 2260 Broadway, you divide 226 by 2, which gives 113, and then subtract key-number 31, which gives 82. The bank is actually at the corner of Broadway and 81 St., but 82 is close enough.

How would you write a program to provide cross-street numbers for the avenues of Manhattan? For instance, find the cross-streets for:

123 Broadway
234 Amsterdam
345 Central Park West

There are 30 avenues in Manhattan with key numbers, but these three will do for examples. One involves a simple calculation; the other two are a little more complicated.

According to the Radio Shack manual, various operations can be performed on the number part of the street address. The chapter on strings shows how to use VAL in determining if a street number is odd or even, which is a fairly simple operation. But is there a way to peel off the number and leave the street name to be operated on?

I called Radio Shack's Customer Service number. The woman suggested ways that would work, but only if the number part were always the same length.

But the number can vary from one to four digits, I reminded her. She consulted with someone else, and came back to say, "Well, sir, you'll just have to work around that."

Suppose you take a VAL for the number part, and try to subtract it from the string, with

```
100 READ A$
110 B=VAL(A$)
120 PRINT A$-B
300 DATA 123 BROADWAY
```

which brings up

```
TM ERROR IN 120
```

because you're mixing a string with a non-string which is a type mismatch.

Why not turn the non-string number back into a string, with STR$, like this

```
120 C=STR$(B)
130 PRINT C
```

However, this causes

```
TM ERROR IN 120
```

because, in turning B back into a string, we forgot to use C$ instead of C. So we use C$

```
120 C$=STR$(B)
130 PRINT C$
```

and we get a printout of 123, so we add

```
140 D$=A$-C$
150 PRINT D$
```

which brings up

```
TM ERROR IN 140
```

not because of a type mismatch, but because, as the Model III Disk Basic manual puts it, "string values cannot be used in arithmetic expressions." The Model I, Level-II manual says, "there is only one string operation—concatenation, represented by the plus symbol+." To prove this, change the minus to a plus in line 140

```
140 D$=A$+C$
```

and the printout will be, of course

```
 123
123 BROADWAY 123
```

(Why is the first line indented?)

If you try something like

```
140 C$=-C$
```

you'll also get a TM error, because there's no such thing as a negative string (but there is a catchy rhyme).

So now what?

The Power of INSTR

The answer lies in the use of three string functions. We use them to read the length of the address string, find the location of the space in the address string, subtract the position-number of the space from the length of the string, and use the difference to read characters from the right end of the address string:

```
100 READ A$
110 L=LEN(A$)
120 I=INSTR(A$," ")
130 PRINT L,I
140 B$=RIGHT$(A$,L-I)
150 PRINT B$
300 DATA 123 BROADWAY
```

In line 110, LEN counts the character length of string A$, which is 12. The INSTR in line 120 provides the location of the space in string A$, which is the fourth character. Or in the words of the manual, INSTR searches string A$ to see if it contains the substring that consists of a space, and if so, returns the starting position of the substring in the target string.

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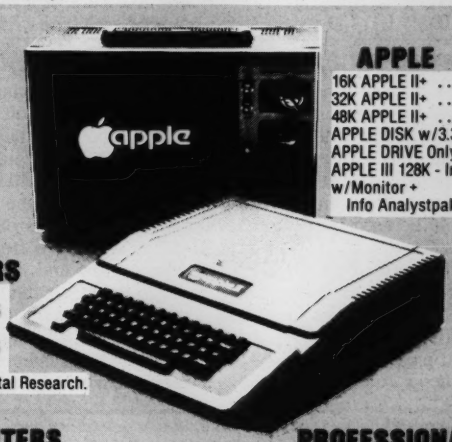

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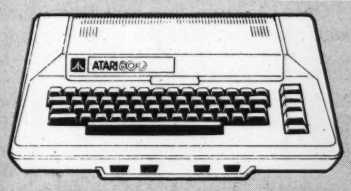

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Line 130 prints out the 12 and 4. Line 140 subtracts the 4 from the 12, and then returns the last 8 characters from the RIGHT end of string A$. When run, this program produces

```
12  4
BROADWAY
```

But INSTR is a Disk Basic function. How do you peel the number off the address in Level-II Basic?

In the Level-II manual's chapter on strings, a paragraph starts, "Using the intrinsic string functions MID$ and LEN$, it's easy to create a very handy string-handling subroutine, INSTRING. This function takes two string arguments and tests to see whether one is contained in the other."

The subroutine can be simplified because we know that no address will have over four digits in it, so the space won't be past the fifth character, thus eliminating the need for LEN$. Also, we know the space is only a single space. So the subroutine in the Level-II manual can be turned into a couple of much simpler lines, without LEN$. (INSTRING was of course the inspiration for Disk Basic's INSTR.)

For Level-II use, replace line 120 in the Disk Basic version with lines 114-126:

```
114 Y$="  "
118 FOR I=1 TO 5
122 IF Y$=MID$($,I,1) 130
126 NEXT
```

Note first that line 122 does not need a THEN before the 130. The Level-II manual says, "It is optional except when it is used to specify a branch to another line number." The Model III Basic manual is more specific, "THEN is optional except when it is required to eliminate an ambiguity, as in IF A<0 100. THEN should be used in IF-THEN-ELSE statements."

In line 122, MID uses the FOR/NEXT I-loop to look for a match between one-space string Y$ and one of the first five characters in address-string A$. When it finds the space at position 4 in string A$, the program branches to line 130.

The Address Routine

Let's finish up the address-finding program. First replace line 150 with

```
145 C=VAL(A$)
147 D=INT(C/20)
```

Line 145 supplies the number part of the address. Line 147 does two things: it "cancels the last figure of the number" and also "divides the remainder by 2." What is the INT for?

Now we have to write lines that will cause a branch from a particular avenue name to a routine that operates on the number preceding that name:

```
150 IF B$="BROADWAY" THEN 172
160 IF B$="AMSTERDAM" THEN 180
170 E=INT(C/10)+60: GOTO 200
```

If the avenue is neither Broadway nor Amsterdam, then it must be Central Park West, and so the program will "fall through" to line 170. For Central Park West, we do not "divide the remainder by 2," but instead "drop last figure, add 60 to remainder."

The rules for Broadway are a little more complicated. According to the instructions, "Up to 754, below East 8th Street. Above 754, deduct following key number: From 754 to 856 deduct 29. From 857 to 999 deduct 25. Above 1000 deduct 31."

So we take care of the first part with

```
172 IF C<754 THEN 210
```

which branches to a PRINT line we'll look at later. As for writing a program line that will take care of a number between 754 and 856, we could write a line starting with

```
IF C>=754 OR C<=856
      THEN E=D-29
```

which may at first glance seem as though it would work. But on closer examination, or if you try to use it in the program, you'll find that if C is greater than (or equal to) 754, the program will never get to the OR, but skip over it to the THEN E=D-29. No matter what the Broadway address over 754 is, it will be treated as though it's between 754 and 856, and the program will go right from this line to a PRINT line, never reaching any of the lines in between.

But by simply using AND instead of OR in that line, and in lines like it, we solve the problem. The AND in line 174 means that any address between 754 AND 856 will be taken care of by that line alone.

```
174 IF C>=754 AND C<=856
      THEN E=D-29: GOTO 220
176 IF C>=857 AND C<=999
      THEN E=D-25: GOTO 220
178 IF C>=1000 THEN E=D-31
179 GOTO 220
```

Amsterdam is an easy one, requiring only adding 59 to the key number for any address on that avenue:

```
180 E=D+59: GOTO 230
```

Now we get into the printing lines:

```
200 PRINT C;"C.P.W. IS AT":E:"ST."
205 GOTO 100
210 PRINT C;"BWAY IS BELOW EAST
      8 ST.
215 GOTO 100
220 PRINT C; "BWAY IS AT";E;"ST."
230 PRINT C;"AMST IS AT";E;"ST."
235 GOTO 100
```

Note that line 220 takes care of all Broadway addresses except those below 754 because we used E in all three lines 174, 176 and 178. Otherwise you'd need a different PRINT line for each of the three situations.

Without the GOTO 100 after each PRINT line, you'd print out all the subsequent PRINT lines.

All that remains now is to add DATA lines to test the address-finding program, including some new ones to test the lines written for Broadway addresses:

```
300 DATA 123 BROADWAY
310 DATA 234 AMSTERDAM
320 DATA 345 CENTRAL PARK WEST
330 DATA 800 BROADWAY
340 DATA 900 BROADWAY
350 DATA 1100 BROADWAY
```

If you wanted to use this program "for real," you'd have to add lines to take care of some or all of the other 27 Manhattan avenues, nearly all of which would require adding only three lines each: one line like 160, another like line 180, and a third like line 230. Of course, many of the PRINT lines can be combined, without having to use a different one for each avenue. How would you do that?

Once you've got lines for all the avenues added to the program, then you can simply replace line 100 with

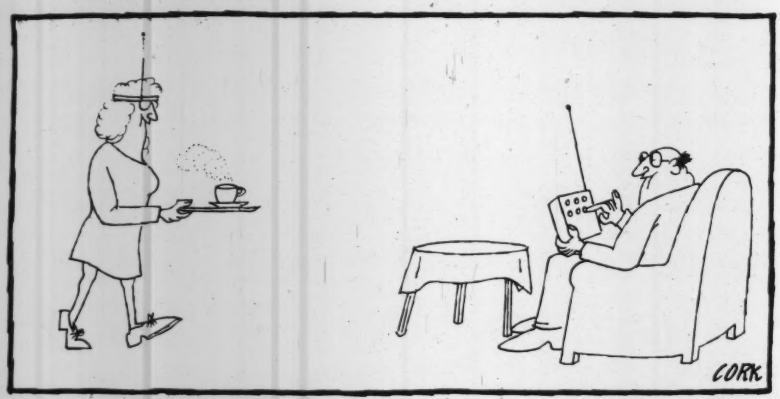
```
100 INPUT A$
```

eliminate lines 300-350, and you've got a program that will find the cross-street for any address on Manhattan's 30 avenues.

The point of all this, as you probably realized at least a page ago, is not to build an address-finder, but to look at some simple techniques involving strings. If you knew them all, please consider that many readers of this column are just getting started with strings.

Boolean For Short

Here's something you may not know: how to reduce number comparisons to a



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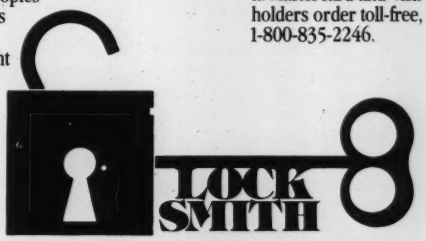

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CIRCLE 201 ON READER SERVICE CARD

minimum line-count. For instance, the number-comparing parts of four lines in the address-finding program can be reduced to a single line, by using Boolean algebra.

Boolean algebra involves what the Level-II and Model III manuals call logical operators. Both manuals are pitifully deficient in discussing this important subject, and as a result many TRS-80 users have little or no idea what can be done (and in a minimum of space) with AND, OR, NOT, etc.

Replace lines 172-179 with these:

```
172 DEFFNG(C)=-((C> =754)+(C>
    = 857)+(C>=999))
174 ON FNG(C)+1 'GOTO 210, 175,
    176, 178
175 E=D-29: GOTO 220
176 E=D-25: GOTO 220
178 E=D-31: GOTO 220
```

The right side of the DEFFN statement is a Boolean expression containing three terms connected by OR logical operators. If, in the first term, the Broadway address is less than 754, the expression is false, and equal to 0. If the address is greater than or equal to 754, the expression is true, and equal to -1.

If the address is below 754, all three terms are 0, and because they are ORed together, the three-term expression is equal to 0. Adding 1 to it allows the ON/GO statement to branch to line 210, for addresses below East 8 St.

If the first term is true, then the expression has a value of -1, which is made +1 by the minus sign at the beginning, and by adding a 1 in line 174, causes a branch to line 175.

If the Broadway address is 900, then the first two terms in the expression are -1 because 900 is greater than 754 and 857, and the total of -1 terms is -2. If the address is 1100, the three terms are all -1, for a total of -3. These become 2 and 3 via the minus sign, then 3 and 4 via line 174, and cause branching to lines 176 or 178.

Thus, through the use of some fairly simple Boolean algebra, we have an expression whose value is either zero or from one to three minus-ones, which are easily converted for use in an ON/GOTO statement for branching.

The Boolean lines can be made more elegant, as can the entire address-finding program; both were simplified for tutorial use. The DEFFN statement, like INSTR, is found only in Disk Basic. To conserve memory and to make the program run faster, use integer arithmetic by adding the DEFINT statement or the % sign.

Pocket-Computer Printer

If you're going to buy a cassette interface for your TRS-80 Pocket Computer, why not spend $98 more and get a combination printer and cassette interface?

Figure 1. The TRS-80 Pocket Computer easily connects to the printer/cassette interface to provide a compact combination weighing only 1.25 pounds.

Not only is the tiny printer one of Radio Shack's most fascinating gadgets, but it prints out 5 x 7 dot-matrix characters on regular paper, dark and clear, one line a second, giving you highly legible hard copy of your programs or your results. Because it has a built-in rechargeable Ni-Cad battery, you can carry it along just as easily as the Pocket Computer.

You can also use it as a portable electronic memo pad, but there are only 16 characters to a line on the 1½-inch-wide paper, so you'd have to key in a lot of PRINT lines to record much of a memo.

The printer mechanism looks very much like what Sharp (which makes the PC for Radio Shack) built into their EL-7001 Memowriter, a calculator looking somewhat like the PC but with a "memo" mode for using it like a typewriter for brief messages.

The small 16-page manual is one of Radio Shack's best, covering just about all the points and using two dozen illustrations. You remove the pin-cover from the left end of the PC, and slide the PC in the printer's grooves until the pins engage. The paper, which costs only $1.75 for six rolls (three come with the printer), is easily inserted; a Paper Advance button moves it through the mechanism. The printer ribbon comes in an easily installed cartridge; just push it into place.

A power switch turns the printer/interface on or off; a print switch activates the printer, so you print only what you need. A remote switch controls a cassette recorder when it's connected; when on, the recorder is started and stopped by the Pocket Computer; when off, by the recorder's own keys.

Also supplied are a cable for connecting the recorder to the printer/interface, and an AC adapter for recharging the built-in battery. One charge is said to be good for about 8,000 print lines.

Ordinarily, the first four columns are reserved for line numbers and the separator colon. But when PRINT items are separated by semicolons, all 16 columns are used for printout, as they are if you write memos in quotes in PRINT lines.

```
100:INPUT A,B,C
110:D=(A*A+B*B+C*C)
    *C) (.5)
120:PRINT D
130:END
```

In the RSC-5 catalog printed in 1981, the Pocket Computer was priced at $249; in the RSC-6 catalog (also 1981) it was listed at $229.95, and the printer/interface at $149.95. Both prices were lowered "for the months of November and December only," as I remember the newspaper ads, to $169.95 for the PC and $127.95 for the P/I. However, Radio Shack decided to continue these prices into 1982, as well as the $29.95 price for the 26-3503 cassette interface that was originally $49.

For $14.95, you can get a padded vinyl case that holds the PC and P/I and extra paper, or the "recommended" Minisette-9 cassette recorder, the price of which hasn't changed from its original $79.95.

Games II for PC

For $14.95, you get two cassettes with eight games for the Pocket Computer that "let you test your deductive reasoning, marksmanship, and gambling abilities," according to the 24-page manual.

In *Missile Marksman* you try to hit the target by adjusting the launch angle and the amount of propellant. There are no graphics, of course, to show whether you shot short or long, so you get a readout telling how far, in miles and feet, your shot was from the target.

In *Baccarat* you are the croupier, against two experienced players, in a game similar to *Blackjack*, which is the next game (you play against the dealer), followed by *Aceyducey*; three card games in a row.

One-Armed Bandit simply displays three words instead of the pictures of cherries, plums, etc., displayed by slot-machines; different combinations pay different odds. *Pokerslot* is a similar game, displaying five cards that compose your hand, with five of a kind winning $5,000, etc.

Numguess is similar to the Mastermind game, in which the computer gives you clues, here called direct and indirect hits, as you try to guess the hidden number. *Craps* is the standard game of dice.

These eight games can all be fun if you don't mind a minimum display, of a few words or numbers, on a 24-digit dot-matrix LCD display. The eight have been made about as interesting as possible within the limitations of the Pocket Computer, which aren't all that great once you get right down to playing. In fact, you may get an added kick out of playing games on a computer smaller than two cassette boxes.

Civil Engineering on the PC

Described as an "on-site assistant" in the catalog, this $24.95 package of two cassettes for the Pocket Computer consists of seven programs including Simple-Beam, Cantilever-Beam, and Fixed-Beam calculations (shear, moment, deflection), Column Characteristics (buckling, loading), Cylinders (stress) and Bolts (torque), Section Computations, and Vector Operations.

The 32-page manual provides full details on using these programs, describing all parameters, showing formulas, and giving an example of using each one.

Short Program #29: Color-Joystick Sound

George Trepal of Augusta, GA, sent "a short program to play on a TRS-80 Color Computer with a joystick:

```
10 X=JOYSTK(0)
20 Y=JOYSTK(1)
30 IF X=0 THEN X=1: IF Y=0
   THEN Y=1
40 SOUND X,Y
50 GOTO 10
```

"The a/d conversion turns out a value from 0 to 63 for the joystick. A more interesting program comes from adding the following lines:

```
15 X=INT(X*3.9)
25 Y=INT(Y/8): IF Y<1 THEN Y=1
```

"This program should be kept away from children if a non-deaf adult has to stay in the same house as the computer."

According to George's program notes, line 10 is for "horizontal left joystick," line 20 for "vertical left joystick," line 30 "gets rid of zero," and line 40 makes a sound of tone X for duration Y.

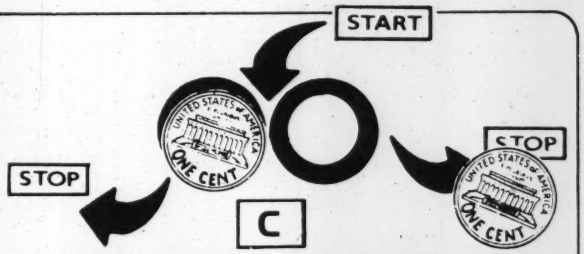
The horizontal coordinate controls the sound frequency (low at left, high at right) and the vertical controls its duration (short at top, long at bottom). You'll need a very delicate handling of the joystick to play a recognizable tune; you'll go crazy trying to play the first two solo bars of "The Flight of the Bumblebee."

The shorter program gives the sound a range of only a couple of notes, so use additional lines 15 and 25, which provide a range of over four octaves, although with very little control over the top half.

On my Color Computer, the highest, shortest note is at about 1:30 (considering the face of the joystick case as a clock dial), and the lowest, longest note is at about 7:30.

If this program doesn't work with your joystick plugged into LEFT JOYSTK, try plugging it into RIGHT JOYSTK. □

"It's a love letter from Herbert. I think he's goofing off at work again."



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CIRCLE 118 ON READER SERVICE CARD

Harold L. Novick

m...software legal forum...s

The subject of this month's Software Legal Forum was prompted by a letter from Nate Salsbury. Mr. Salsbury's letter and the response are printed below. The subject is the always interesting one of copyrightable subject matter, breadth of copyright protection, and the ability to computerize a well-known game.

Dear Mr. Novick:

I have suddenly discovered that our local Community College has subscribed to *Creative Computing* for several years. I have been going through back issues (January/February 1980) and I'm fascinated by the intricacies of the copyright laws which were your topics in those issues. No matter how many times I read them, I feel that I'm trying to stuff fog into a pillow case—I just can't seem to find the "handle." Let me ask a specific question.

In the February, 1980 edition of *Creative* there is an article outlining a program to simulate "Black Box"—a well known game published (I believe) by Parker Bros. As far as I can tell, the program attempts to reproduce all aspects of the "board," concepts, rules etc. of the game as closely as possible. The article even "admits" that it is, effectively, a computerized *copy* of the game. Furthermore, in a boxed note accompanying the article, Mr. D. Ahl notes that he ran a *contest* for a computer version of "Black Box" in 1977.

Nobody seems to be writing this material from a prison. Why is this form of "copying" (apparently) not a violation of the copyright laws? The people participating are not economically "pure"; the author gets paid for the article; Mr. Ahl's magazine prospers from the great interest in games—his circulation, to some extent, increases in proportion to the number of interesting game programs he presents.

Why doesn't/can't Parker Bros. (or whoever published and copyrighted "Black Box") haul all of these people to court and "take all"? Apparently it is *not* the concept, rules, board layout etc. which has been copyrighted *but*, if not those things, what's left?

I hope you'll find a moment to put some sort of explanation to this mystery in it.

Very truly yours,
Nate Salsbury

Dear Mr. Salsbury:

Thank you for your letter. I will try to "defog" you.

At the risk of oversimplifying matters on the one hand or confusing you more on the other, let me attempt to rephrase your question. You have basically asked: How can someone write and publish a computer program to play a well known game? As in every legal question, it is far, far easier to ask the question than to provide an answer.

I always like to answer a question first and then explain the exceptions and limitations of the answer. A game, *per se*, cannot be copyrighted. A game can, however, be patented. In fact, the game Monopoly was patented sometime around 1939 and has been in the public domain since the patent expired sometime around 1956. All a copyright can protect is a certain expression of a game or a certain description of a game. It cannot, however, protect and prevent copying of a concept of a game or the particular manner in which the game is played.

Your letter involves a particular game, "Black Box," described in the February, 1980 edition of *Creative Computing* by Mark Zimmerman. I will have to describe, briefly, the game because legal questions can only be accurately answered with respect to a particular set of facts. We lawyers, then, reason by example to determine whether the same or a different result would occur if some of the facts were changed.

The game of "Black Box" involves the use of a checker board display in which there is an 8 x 8 array of boxes. In Mark Zimmerman's computerized version, the 32 peripheral boxes are numbered sequentially in a counter clockwise direction beginning with the upper left hand box along its side face. Five balls are hidden inside the checker board in a particular box and the object of the game is to guess the location of the five boxes by sending a probe in from a numbered edge. As in chess, the probe moves in a straight line unless it is absorbed by a ball directly in front of it, is deflected to the right or left if the probe encounters a ball in the forward left hand square or the forward right hand square, respectively; and is reflected if it would be deflected before it got onto the board or if it encounters balls in both its forward right and left hand squares. The object is to guess the location of the five balls and a penalty is assessed for each ball which is guessed incorrectly and for each probe that is made.

As the game is understood, it uses neither a patented concept nor a particular game board. Obviously, a checker board is in the public domain and cannot be copyrighted. In contrast, the game board of the game Monopoly is copyrighted and therefore cannot be copied, whether it be by a computer program "writing" the board on a video screen or by photographic techniques. Secondly, let it be assumed that the rules were simply a restatement of some generally known concepts, much in the way that I restated the rules set forth by Mr. Zimmerman in his article.

As each particular fact pattern is investigated, other subtleties can arise where the principle of copyright law would apply. For example, in some games where the particular expression of the game rules was the only way to express the concept of the rules, then even though a copyright was claimed those rules could not be protected.

For example, if the rules consisted of nothing but a series of algorithms, a mathematical principal if you will, then the rules would not constitute copyrightable subject matter. Translated, this means anybody could copy even the exact expression of those rules.

Another subtlety which is quite applicable to computerized board games is the legality of copying particular characters that appear on the board or are in the form of playing pieces. The test would be whether there was a substantial copying of the expression of the game and any particular uniqueness (translated as copyrightability) of the

Harold L. Novick, Larson and Taylor, 727 Twenty-Third Street South, Arlington, VA 22202.

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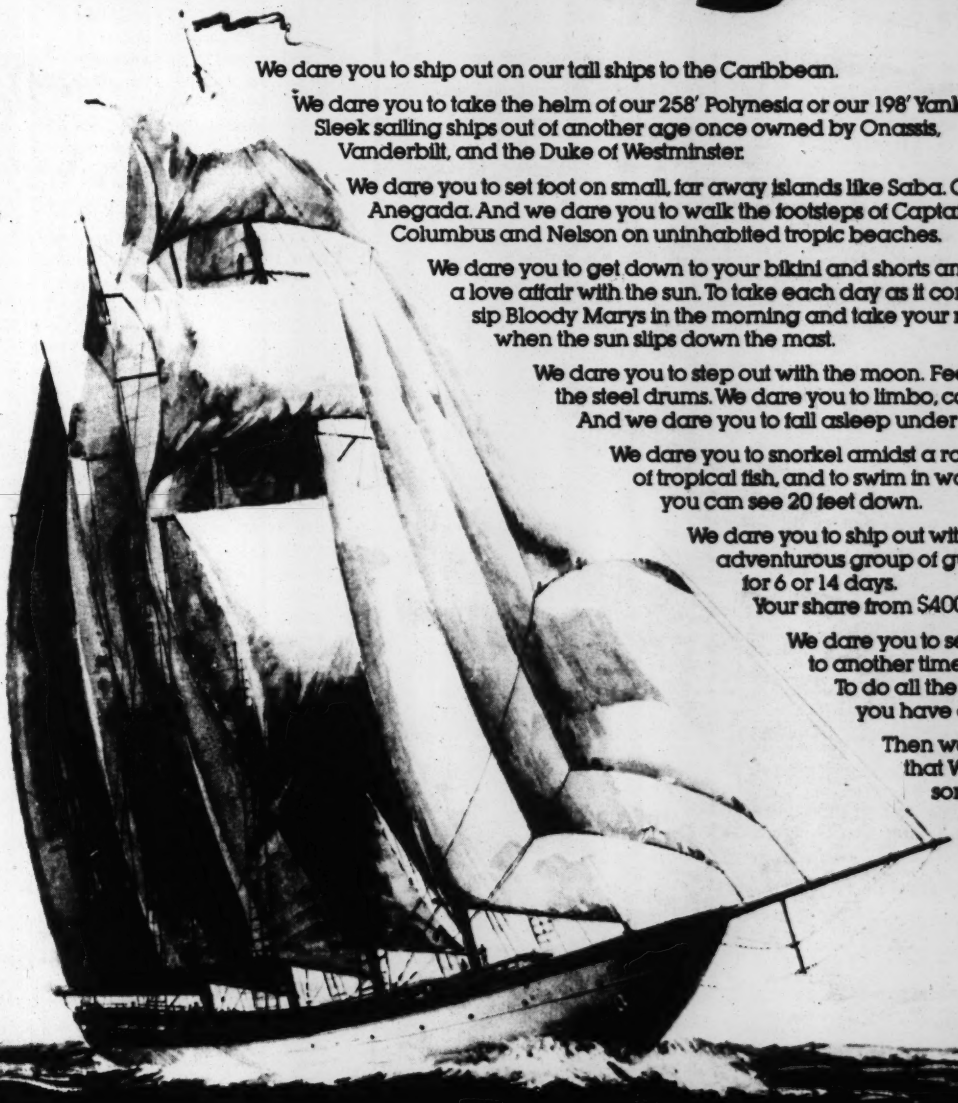

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CIRCLE 131 ON READER SERVICE CARD

Legal Forum, continued...

character. In the case of the characters in the arcade game "Galaxian" it seems that the copying of the shapes of the particular characters was sufficient to convince most of the judges ruling in the matter that there was a "substantial copying" of the entire "game." On the other hand, if the character was in the public domain, such as a conventional chess piece, then clearly a computerized picture of the chess piece could be used by the computer programmer.

A third example, somewhere in between the other two, would be the copying of a game board in which only the outline shapes of the various spaces are depicted in the computerized version. The question then becomes, "Is copying only the shapes of the spaces without any of the other indicia or ornamentation of the board game sufficient to constitute copyright infringement?" Again, the answer would depend upon the specific facts. If the particular arrangement and shape of the spaces were unique, then copyright infringement would probably lie. On the other hand, if the arrangement were more like Monopoly, then perhaps there would not be a "substantial copying."

Returning now to the "Black Box" game, the answer to your question is that in this particular case there does not appear to be any copyright infringement because the "game board" is not copyrightable subject matter, the expression of the particular rules set up in the Parker Brothers game were not copied in sufficient particularity (this has been assumed), and the game concept is not copyrightable. Consequently, Mr. Zimmerman's article was not written from prison and, in the opinion of this writer, is not a copyright infringement.

In order to set your mind at ease, if the copyright issue were simple, there would be no need for copyright attorneys or a column such as the Software Legal Forum. □

"The electronics technician just told me what was wrong with the computer, Jones—the programmer is defective!"

Why would anyone spend $59.95 for a joystick?

Super Joystick

Super Joystick

Star Wars. Played with paddles, it's difficult at best and frustrating at worst. But with a joystick, it becomes an entirely new experience. It's still challenging. It's also fun. And very addictive.

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The Apple high-resolution screen is divided into a matrix of 160 by 280 pixels. To do precise work on this screen, you need a precise device. Most potentiometers used in paddle controls are not quite linear. If you rotate a paddle control at a constant speed, you'll notice that the cursor speeds up slightly at the beginning and end of the paddle rotation.

The Super Joystick has a pure resistive circuit which is absolutely linear within one tenth of one percent. In other words, it would give you precise control over an image of 1000 by 1000 pixels, were such resolution available. Thus it is suitable for high precision professional applications as well as educational and hobbyist ones.

Matched to your application

The Super Joystick also has two external trim adjustments, one for each direction. This allows you to perfectly match the unit to your application and computer. Say you want to work in a square area instead of the rectangular screen. Just reduce the horizontal size with the trim control.

How many times have you played Space Invasion and had your thumb ache for hours from the repeated button pressing? This won't happen with the Super Joystick. Its two pushbuttons are big. Moreover, they use massive contact surfaces with a life of well over 1,000,000 contacts. A few games of Super Invasion using these big buttons will justify the purchase of the Super Joystick.

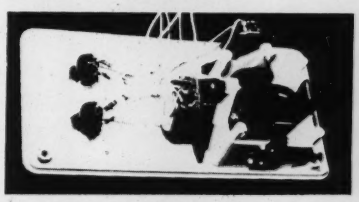
The Super Joystick is self-centering in both directions. That means when you take your hand off it, the control will return to the center. However, if you want it to stay where you leave it, self-centering may be easily disabled by removing two springs.

The Super Joystick plugs right into the paddle control socket and doesn't require an I/O slot.

High-quality construction

The sturdy case of the Super Joystick matches that of the Apple computer. Every component used is the very highest quality available. The Super Joystick even uses a full 16-conductor ribbon cable and you can add a second joystick (using our Select-A-Port extension unit for example) if you wish. The first Super Joystick replaces Paddles 0 and 1. You may not realize it, but the Apple has the capacity to support four paddle controls. A second Super Joystick would replace Paddles 2 and 3.

We invite your comparison of the Super Joystick with any other unit available. Order it and use it for 30 days. If you're not completely satisfied, return it for a prompt and courteous refund plus your return postage. You can't lose.



By removing two springs, self-centering can be defeated.

The Super Joystick consists of a self-centering linear joystick, two trim controls, and two pushbuttons mounted in an attractive case. It comes complete with schematics and a 90-day limited warranty. Cost is $59.95.

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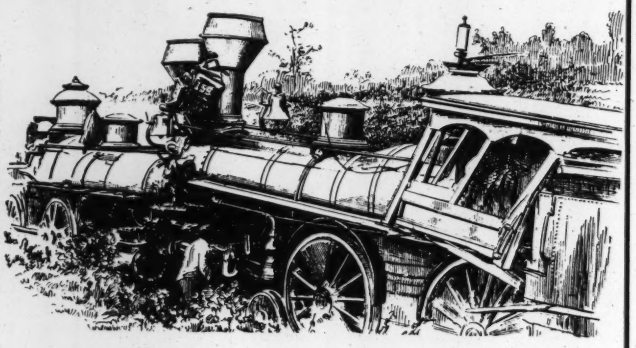
The Cannon Ball Puzzle



The following saga concerns the meeting long ago of the Cannon Ball Express and the Bowling Ball Special. One dark night, at exactly 8:00 P.M., the Cannon Ball Express left Chicago, traveling at a speed of 60 miles an hour, and headed east for New York. At exactly the same moment the Bowling Ball Special left New York, traveling at a speed of 45 miles per hour, heading for Chicago. Both trains were non-stop to their destinations. Sometime during the night, *where* no one knows, the trains were switched onto the same track. The rest is history.

An interesting puzzle has been propounded concerning this event. At exactly one hour and twenty minutes before the trains crashed into one another how far apart were they? For the sake of the puzzle we will say that the distance between New York and Chicago is 800 miles.

I Spy

Over ninety years ago two spies met briefly on the dance floor of the Hotel Intrigue in Vienna. One of the spies whispered to the other, in code of course, "Fly for your life." The code that she used was to substitute numbers for letters. A different number is used for each letter. When the correct numbers are substituted the addition will prove to be correct. One hint I can give the puzzler is that *I* stands for *1* and *O* stands for *zero*. You have 15 minutes to decipher this problem.

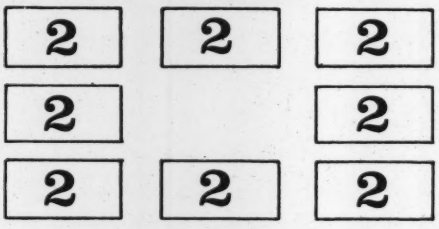
The Juggling Fool

Zeppo, the clown, a fool of renown, has a problem I'm sure that you'll like. In our picture we find him balanced on top of two barrels. The barrels are shown in outline for a reason. You must cut these two barrels into four equal pieces of the same size and shape. (You will cut each barrel into two pieces.) Now, the fun begins. You are required to rearrange these four pieces into a perfect circle.

Don't let Zeppo have the last laugh on you!

The Pig Pen Puzzle

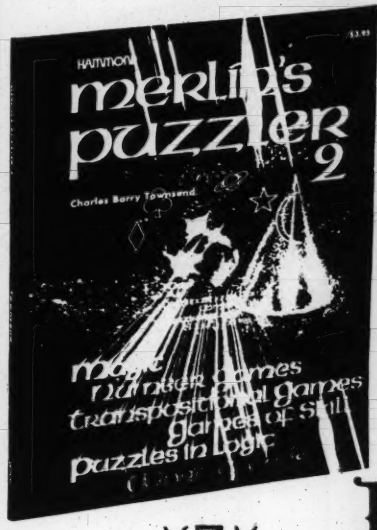
Here's a quickie. A farmer had 16 pigs, enclosed in 8 pens, arranged in the shape of a rough square. How could the farmer add 4 more pigs to the pens so that there would still be 6 pigs along each side of the square?



A Difficult Division

A wine merchant has in his cellar 21 casks. Seven are full of wine; seven half-full, and seven empty.

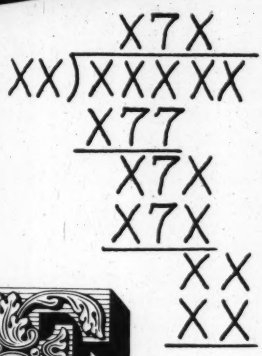
How can he divide them (without transferring any portion of the liquid from cask to cask) among his three sons—Dick, Tom, and Harry—so that each shall have not only an equal quantity of wine, but an equal number of casks?



No Two In The Same Row

Arrange the twelve court cards and the four aces into four rows of four cards each as shown in the drawing at the right. Now move the cards around until they are in such order that no two cards of the same suit or of the same value will be found in any row of four cards—either horizontally, vertically or diagonally. This is a famous old card puzzle and is still one of the best.

(This puzzle is from the book *Merlin's Puzzler 2*. This book, along with *Merlin's Puzzler 1* and *Merlin's Puzzler 3* can be purchased from Creative Computing. Each book is 128 pages long, 8½" × 11" in size and filled with the best puzzles and games that have amused and delighted thinking people for the last 100 or so years. Numbers 1 and 2 are available as a set for $7.50. Number 3 costs just $4.50. Why wait when hundreds of puzzles and problems are waiting for you to solve them?)



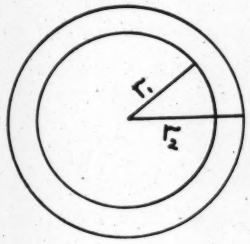
Where In The World?

Here we go again students. Willard Wordsworth is back with another "Scrambled Letters" geography test for you. Below is a list of ten countries that existed during the time of the Roman Empire, circa 117 A.D. Willard has very inconveniently, for you anyway, mixed the letters up in each name. It is up to you to rearrange them correctly. Seven out of ten is a must to pass this test.

(1) DUMINAI
(2) SMTMEOPAAOI
(3) CTERAH
(4) ICNSAAD
(5) NERAUAITAM
(6) TDAAAMLI
(7) OIAIN
(8) GAEANMIR
(9) YILAD
(10) RAHNEIBI

Lucky Sevens

"EXTRAORDINARY," exclaimed Merlin. "Rupert, you do come up with some amazing puzzles to tax our wits. Now, let me see if I have this right. We have here a simple case of division, but you have gone and substituted X's for all of the numbers in the expression except an occasional 7 here or there, and it is our job to reason out what these numbers were and to write them back into the expression? This is an interesting problem, Rupert, now let me see, if I were to divide by . . ."



The Steel Band

In this puzzle a steel band is placed around the earth at the equator. The band is cut and 10 feet is added to it. Some magical force now holds the band an equal distance away from the earth. What is this distance? (For the sake of simplicity assume that the radius of the earth is 4000 miles. Also, use 3.14 for pi.)

This puzzle was sent to us by Mr. Gary W. Dode, of Whitehall, Michigan. Merlin is sending Mr. Dode a copy of *Merlin's Puzzler* for his contribution. Thank you!

A Problem In Addition

The following problem in addition is from *Merlin's Puzzler 3*. It's not as hard as it looks. "Take the digits 1 through 9 and arrange them in such a manner that when they are added up the total will be 99,999."

1 2 3 4 5 6 7 8 9

Answers on page 216.

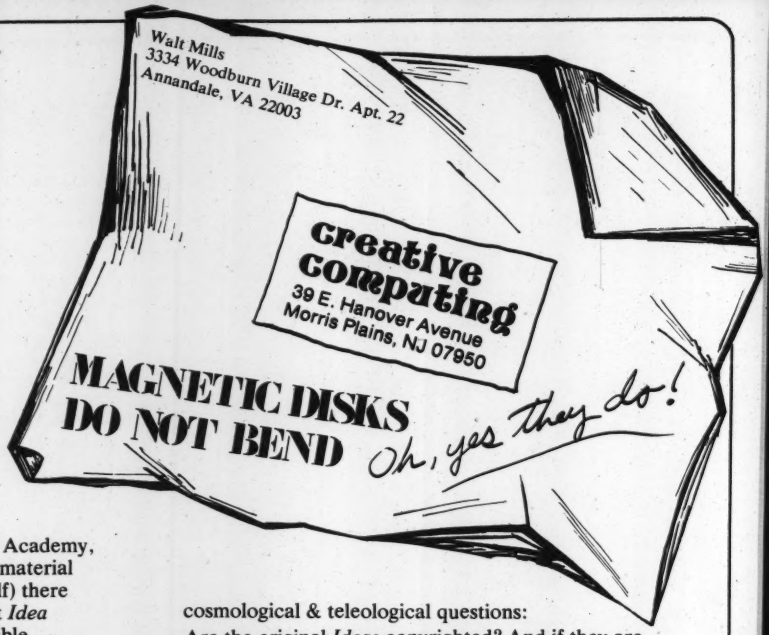
That's all folks. I think that Merlin has brought you an interesting mix of puzzles this month, and we both look forward to seeing you all again next month in *Creative Computing*.

Your editor,

Charles Barry Townsend

Xerox Operator Maximus

Peter Payack



In his advanced Theory of Knowledge class at the Academy, that good ol' Professor Plato taught that for every material object on the planet (including the planet itself) there existed in a far off heaven-like realm a perfect *Idea* of that particular thing that was eternal, incorruptible, immaterial, and (I'm extrapolating here) non-carcinogenic, rust proof, and warranted for life! Furthermore, these *Ideas* are somehow more real than their manifestations on Earth, which (I'm sorry to say) are just shadowy reproductions with the quality of a xeroxed Mona Lisa!

This concept of a supreme deity being portrayed as The Great Xerox Operator, who not only runs off copies, but imperfect and faded ones at that, caused me considerable personal anguish, not to mention raising some most disturbing cosmological & teleological questions:

Are the original *Ideas* copyrighted? And if they are, By Whom, and for what duration of time? (Eternity?)
Who gets the royalty payments for the reproduced material?
Who (or What) built the Xerox Machine-In-The-Sky?
And by implication, was it always there *ad infinitum*, or was it built *ex nihilo*?
Who services the machine when it breaks down?
And by extension, who pays for these charges, or are they "taken care of"?
Does God own the Machine outright, or does he lease it? □

Peter Payack, 64 Highland Avenue, Cambridge, MA 02139.

The Number-Cruncher's Lexicon

Jim Peterson

For years I've been hanging around computer people. Many of them probably think I'm some weird kind of groupie, but that isn't it at all. Actually, I've just been trying to figure out what the hell they're talking about.

My research wasn't easy at first. Whenever I located a group of them and began my approach, they would spot me as an outsider and scatter. I slowly developed better stalking techniques. I began disguising myself as one of them, carrying Fortran manuals and numerical analysis texts around. In later years I even discovered that I could lure them in by flashing a copy of *Creative Computing*.

These years of dedicated investigation have paid off, and I am now ready to share my discoveries with the world. All of you who have previously been baffled by the argot of this strange tribe need remain no longer in ignorance. I am presenting my findings in the form of a lexicon which will enable you to decode the most cryptic of statements in computer jargon.

James M. Peterson, Ph.D., 2125 Banks Ave., Superior, WI.

Assembly Language: Profanities used by people who build computers from kits. (Such people are termed "cursors.")

Bug: A parasite which infests software. It is transmitted by illicit congress between people and programs.

Core: The remains of an Apple when all of the bytes are gone.

Data Processing: An arcane fortune telling method wherein one attempts to extract hidden meanings from numbers. Akin to numerology.

Down Time: Periods when a computer is acutely depressed.

Error: The act of buying a computer.

Hexadecimal: To bewitch a number.

Infinite Loop: See Input

Input: See Throughput

Keypunch: The device that puts the little round holes in the tops of keys.

Line Printer: The device that puts the thin blue streaks across your notebook paper.

Output: See Input

Peripheral: Irrelevant

Real Time: Whenever the computer isn't hallucinating.

Reboot: To repeatedly kick a faulty computer until it starts working again.

Terminal: Said of a computer that is about to die.

Throughput: See Output □

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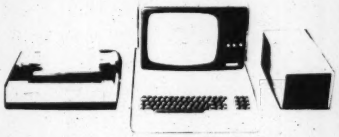

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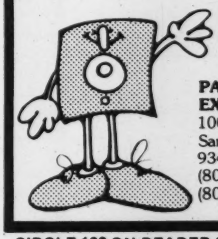

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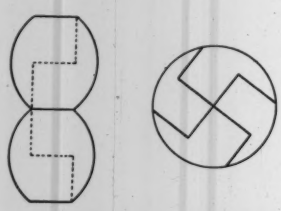
puzzle answers

The Cannon Ball Puzzle: This is somewhat of a trick question. One hour and 20 minutes before the trains met the Cannon Ball Express was 80 miles away from the point of impact, and, the Bowling Ball Special was 60 miles away. Therefore, they were 140 miles apart one hour and 20 minutes before the accident.

I Spy:

598
507
8047
9152

The Juggling Fool: Cut the barrels along the dotted lines. Rearrange as shown.



The Pig Pen Puzzle:

A Difficult Division: According to the conditions of the problem, each son's share will be seven casks (irrespective of contents), and of wine, 3½ casks. The division can be made in either of two ways; Dick and Tom each take 2 full, 2 empty, and 3 half-full casks; and Harry, 3 full, 3 empty, and 1 half-full; or Dick and Tom take 3 full, 3 empty, and 1 half-full cask; and Harry 1 full, 1 empty, and 5 half-filled casks.

No Two In The Same Row:

JS	JH	JD	JC
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KS	KH	KD	KC
AS	AH	AD	AC

Where In The World?: (1) NUMIDIA (2) MESOPOTAMIA (3) THRACE (4) SCANDIA (5) MAURETANIA (6) DALMATIA (7) IONIA (8) GERMANIA (9) LYDIA (10) HIBERNIA

Lucky Sevens:

$$\begin{array}{r} 971 \\ 53\overline{)51463} \\ \underline{477} \\ 376 \\ \underline{371} \\ 53 \\ 53 \end{array}$$

The Steel Band:

$C = 2\pi r_1 \quad C + 10 = 2\pi r_2$

$r_1 = \frac{C}{2\pi} \qquad r_2 = \frac{C+10}{2\pi}$

$r_1 = 4{,}000 \qquad r_2 - r_1 = \frac{C+10}{2\pi} - \frac{C}{2\pi} = \frac{10}{2\pi} = \frac{5}{\pi}$

$r_2 - r_1 = 1.59$ FEET

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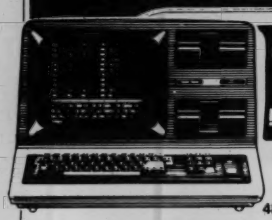

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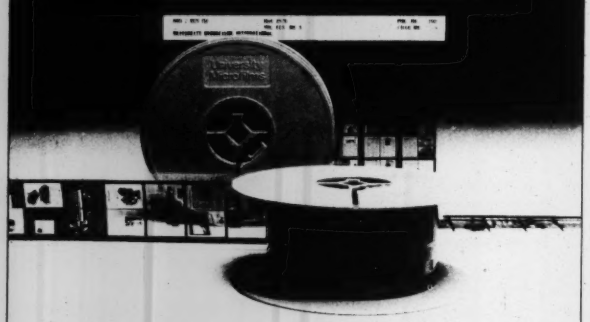

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Taming Your Computer: A Guide for Business and Professional People, by Jerome Kanter. Prentice-Hall Inc., Englewood Cliffs, NJ. 254 pages, hardcover $17.95, paperback $8.95. 1981.

This is a revised and updated edition of *A Management Guide to Computers*, published in 1977 by Honeywell Information Systems, where the author is Director of Planning & Consulting for National Industry Operations.

The nine chapters are: Introduction to Computers, Uses and Applications of Computer Systems, Selecting and Implementing Computer Applications, Mini/Micro Mania, Understanding Software and Programming, Computer-Aided Decision Making, Management Information Systems, Computer-Based Teleprocessing Systems, and Future Use and Growth of Computers. A 2½-page bibliography is included.

Containing a great deal of useful material and written in a semi-informal style, this book would be much more readable and helpful to the person who has "never before been directly involved with computers" if it broke up the page-after-page masses of solid type with illustrations. The book contains only two photographs, of a small computer and a video terminal, both Honeywell products. There is one fine drawing of "How a Computer Operates." There are 36 charts and graphs in the first six chapters, six drawings of system models in the MIS chapter, and a dozen figures in the last two chapters.

If the lack of photos and figures isn't that important to you, and if you are looking for an uncomplicated, non-technical book that will give you a solid understanding of the basics of computers and computing, this is one of the better texts.

If this lack does bother you, try one of the many first-year computer-science textbooks reviewed here in the last few months.

Microcomputer Buyer's Guide, by Tony Webster. Hayden Book Co., Rochelle Park, NJ. 338 pages, paperback $25. 1981.

This is probably the largest and most complete buyer's guide to micros yet published, with over 300 pages 8½ by 10½ inches in size, containing detailed information on microcomputers in general, several dozen software products, over 80 personal computers from 53 manufacturers, and several dozen peripherals.

Part I, on Microcomputer Theory and Applications, consists of 70 pages on micro ABCs, peripherals, software, Basic, desktop personal computers, selection guidelines, word processing, future trends, communications and networking, and education. The style is semi-formal and concise, the material highly informative.

Part II, on Independent Software Products, looks mainly at Z80 and 8080-based operating systems, high-level languages, and applications packages, plus software for the TRS-80, Apple, PET, and Motorola 68XX. Suppliers range from Microsoft to Peachtree, from Hayden to Lifeboat.

Part III covers a wide range of machines, including the Apple II, Data General microNOVA, IBM 5120, NEC PC-8000, Radio Shack TRS-80, Sinclair ZX80, Tektronix 4050, and Wang 2200 series. Each takes up several pages, with photo, hardware and software and details, and prices.

Part IV offers less detail and no prices, but gives enough information to get a good idea of what's available in CRT displays, printers and printing terminals.

This is a valuable reference book the best I've seen of its type, with much information presented in greater detail than anywhere else, and setting a standard that will be difficult to surpass.

Although the book doesn't say a word about the author, Tony Webster is an Australian EE who publishes reports on computer hardware and software, with an updating service. He published this book himself; Hayden distributes it in the USA and Canada, and plans to publish an updated version in 1983.

The Making of the Micro: A History of the Computer, by Christopher Evans. Van Nostrand Reinhold Co., New York. 116 pages, hardcover $14.95. 1981.

This fascinating short "history of the computer" takes half its 100 pages of actual text to lead up to the first digital computer.

Starting with the abacus, and using dozens of photographs and drawings, Evans leads us through Napier's Bones, the slide rule, Pascal's calculator, Leibniz's calculator, Babbage's engines, the Burroughs adding machine, Hollerith's tabulator, the MIT differential analyzer, etc. He explains the operations of these machines without getting bogged down in mechanical intricacies.

Evans writes as much about each inventor as about his machine, which helps make this book much more interesting than if it were merely a description of devices.

Thus we read more about how Konrad Zuse got started on his Z1 relay computer, and how WWII kept him from getting past the Z4, than about the actual computers themselves. From Zuse on, there is more emphasis on inventors and entrepreneurs, one reason being that Evans did not describe how any of these computers worked, which would have taken much more space and made the book much more complicated.

So we get mainly the superficial details of the history of IBM's Harvard Mark I, the British Colossus, ENIAC, EDVAC, and one or two other computers. After that, not one single computer is discussed; Evans goes off into 17 pages on the transistor, the computer revolution, and integrated circuits.

The book is fascinating, and one of the best of its kind, for its presentation of computers before transistors, but the reader interested in the history of computers after 1950 will have to look elsewhere.

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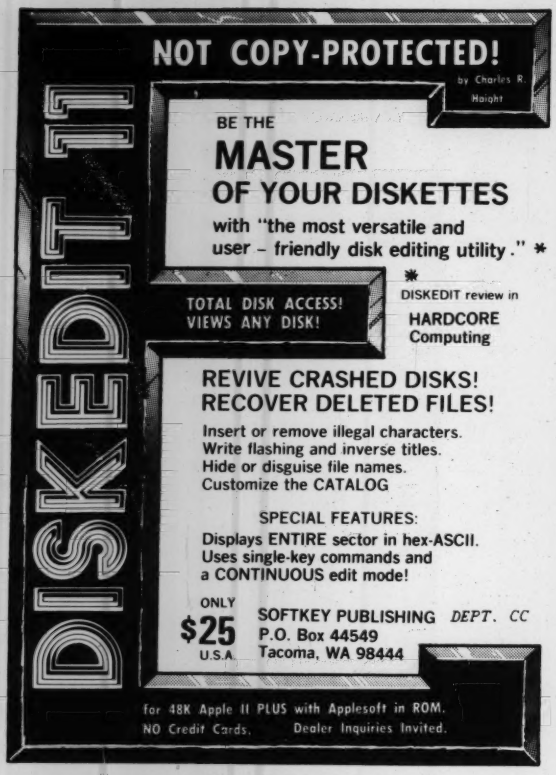
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The Captain 80 Book of Basic Adventures by Robert Liddil. 80-Northwest Publishing Inc., Tacoma, WA. 252 pages, paper. $19.95. 1981.

A long time in the works, *the* book for Adventure fans and programmers is finally available. Robert Liddil, author of the Adventure *Death Dreadnaught*, and a well-known figure in TRS-80 circles, has compiled a three-part (but by no means trivial) collection of treats. The first part is an introduction to the topic, with short chapters on playing, writing, and selling Adventures. The material is light but informative.

The second section contains the listing for an Adventure generator. This program, which requires a minimum of 32K and disk for the TRS-80, takes input from the user concerning rooms, objects, vocabulary, and conditional events, and produces a Basic Adventure. Liddil admits the generator is not perfect (there may be bugs or inefficient coding in the resulting program), but believes it is important enough to include in the book. Even with these flaws, it can greatly reduce the time required to write an Adventure.

The third section contains listings for eighteen Basic Adventures by authors such as Greg Hassett, Lance Micklus, and Scott Adams. The listings are clearly done in large type, and most of the programs will fit in a 16K Model I TRS-80, though Model III owners may have to do a bit of compression. There is also material about each author. While most of the programs have been published elsewhere, it is unlikely that many readers will already have listings for all eighteen of them.

Summing it up, Captain 80 has dropped a treasue. Snatch it up. Adventure fans.—David Lubar.

Using 6502 Assembly Language by Randy Hyde. Datamost Inc., Northridge, CA. $19.95. 1981.

This book is aimed specifically at Apple users, and is written by someone who really knows what he is talking about. Randy Hyde created the LISA assembler, and a large selection of satisfied customers can testify to his credentials. The book takes the beginner all the way from basic concepts such as binary numbering to advanced areas including string handling and debugging. Filled with documented program examples and clear text, the book reads well. Mr. Hyde will never be accused of having a dry style. The strength of the book is that, beyond explaining the 6502 instructions, it presents a wealth of practical information. The sections on arithmetic are especially valuable and comprehensive. Signed and unsigned operations are explained, for both integer and multi-precision applications, along with BCD (binary coded decimal) arithmetic.

Other sections cover basic input and output, as well as I/O that is specific to the Apple, such as paddle and keyboard reading. There is even a section on Sweet-16, the rarely-documented pseudo processor available in the Integer ROM.

The only major drawback of the book is that it assumes the user owns the LISA assembler. Instructions for entering programs, and some of the special techniques described in the book, depend on LISA. While LISA is an excellent assembler, not everyone who buys the book will have it. Some may already have another assembler, in which case they may not want to make an additional purchase. Others, who have no assembler, will probably end up buying LISA. While there is nothing wrong with this, it seems to be an unfair assumption on the part of the author. Basically, the reader can still benefit from the

book if he doesn't own LISA but will gain more if he does. Also, the only mention of the Apple mini assembler is in an appendix taken straight from an Apple manual. Readers would probably have appreciated a more thorough section, along with explanations of the single step and trace routines in the Integer ROM.

The above problems are minor compared to the overall quality of the material. Mr. Hyde has done much to unshroud the mysteries of the 6502.—DL

Apple Pascal Games by Douglas Hegert and Joseph T. Kalash. Sybex, Berkeley, CA. 371 pages, paperback, illustrated, $14.95. 1981.

This handy volume provides users of Apple Pascal with something they haven't had until now: a collection of annotated programs to type in and study. This is not a Pascal tutorial. It is intended for the Pascal user who has learned the essentials of the language and now needs useful, entertaining hands-on practice. To this end, *Apple Pascal Games* provides a graded series of game programs, ranging from very simple to quite complex.

There are twenty-seven games all together, arranged in four sections.

The presentation of each game is divided into two parts. The first is a discussion of how the game works: game rules and instructions for running the program are given, essential algorithms are explained, and a sample run is provided.

The second part is a discussion of the program. Program logic and flow are laid out with logical diagrams. Key elements of the program are highlighted, as are the particular Pascal techniques used to program them. This part concludes with the complete program listing.

Section I consists of nine simple games. These are venerable old standbys like "Nim," "Keno," and "Guessit,"—games that have probably been programmed in every known language on every known computer.

The fifteen games of Section II are also "classics," but more complex. Each of these uses and demonstrates one of the higher functions of Pascal. Examples are the CASE statement in "Kismet," recursive procedure calls in "Telephone," and set types and set operators in "Wumpus."

Section III consists of two games. One is a skeet-shoot game and the other is a paddle-controlled sketch pad. Together, these two programs explore most of the capabilities of the Turtlegraphics Unit.

Section IV is just one game, Cribbage. This is a long program (21 pages of listing) and is written in three parts which are compiled into one program. It is something of a grand finale to the book and uses a substantial percentage of the resources of Apple Pascal. The result is an impressive program which compares favorably with "Kriegspiel Checkers" from the book *Pascal With Style*.

The overall value of this book as a learning tool stands solidly on the programs, which are uniformly well-written.

Although written specifically for Apple Pascal, this book would work just as well for users of nearly any implementation of UCSD Pascal. The programs could be easily modified for other systems. Anyone looking to sharpen his knowledge of Pascal and have fun at the same time will find it well worth the effort.—William Kubeck

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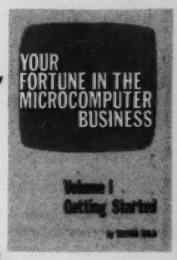

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Robot Manipulators: Mathematics, Programming and Control, by Richard P. Paul. MIT Press, Cambridge, MA. 288 pages, hardcover $25. 1981.

The eighth in the MIT Press series on artificial intelligence, this textbook is by "the world's leading authority on the science of robot manipulation," according to the dust jacket, which adds that this is "the first book to cover all aspects of computer control of mechanical manipulators," and "presents kinematics, statics, dynamics and programming."

The book is heavy with math, of course, and "the chapter on dynamics assumes that the student is prepared to accept the Lagrangian formulation of dynamics. The chapter on control makes use of the Laplace transformation, and the final chapter on programming assumes a knowledge of Pascal," according to the preface.

For a work so complex, the chapter titles are quite short: Homogenous Transformation, Kinematic Equations, Solving Kinematic Equations, Differential Relationships, Motion Trajectories, Dynamics, Control, Static Forces, Compliance, and Programming.

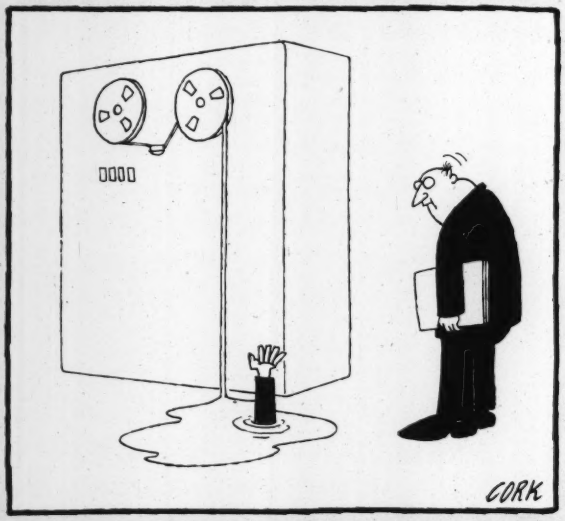
A publisher's note on the indicia page says that to shorten preparation time, the book was prepared by photographing the author's computer printout. The author notes that "The camera-ready copy was produced using Knuth's TEX system," which results in a handsome book.

Those interested in robot control from a personal-computer viewpoint will, for the most part, find the subject to be much more complicated than imagined. Very little of this book is understandable without a solid grounding in mathematics.

Software Wanted: How and Where to Sell Your Program, edited by Eric Balkan. Battery Lane Publications, Box 30214, Bethesda, MD 20014. 105 pages, paperback $25. 1981.

The "how" part—for people who wish to sell programs they've written—consists of five informative articles; the "where" part is 80 percent of this guide and provides details about 76 software publishers.

The introduction says you can let an established software



publisher promote and market your software, or you can market it yourself. The article on writing software for resale says the leading markets, as of 10/81, are CP/M, Apple, TRS-80, and UNIX, offers suggestions (by George Blank) on how to pick a software publisher, and tells what a software package should include.

The article on selling software directly to users offers advice on packaging, pricing, advertising, literature, identifying the user, and piracy. The last two articles tell what to put in your manual, and how to protect your software via copyright and other methods.

The Software Publishers/Marketers Directory tells, for each company, how long it has been in business, its size, whether it sells programs retail and/or wholesale, financial arrangements with the programmer, time required to evaluate a program, documentation required, etc. Most listings take half a page; a few take over a full 8½ by-11-inch page.

All the articles are reprinted from Battery Lane's "Computer Consultant" newsletter; the book includes a coupon offering a $15 discount on the $48 cost of a year's twelve issues, which "provide an update service to the material in the guidebook."

The guidebook seems well worth the price to have all these facts and figures in one handy publication, written in a very straightforward style. It's sold with a money-back guarantee.

Osborne CP/M User Guide, by Thom Hogan. Osborne/McGraw-Hill, Berkeley, CA. 291 pages, paperback $12.99. 1981.

This latest Osborne book, which is nearly the three-dozenth from the Berkeley publishing company, "introduces the novice to the microcomputer system and examines CP/M's function within that system," according to the introduction, which notes that "CP/M is an operating system which...directs the activities of your computer's components, and manages files which contain computer instructions or data."

This sets the tone for a semi-formal self-teaching manual that covers a great deal of ground, from defining "byte" to discussing the systems approach. The eight chapters include an Introduction to CP/M and Operating Systems; CP/M Built-In Commands; CP/M Transient Commands; Assembly Language Utilities; Other Transient Programs and CP/M; MP/M, CP/NET and CP/M Derivatives; Technical Aspects of CP/M; and Putting It All Together: The System Approach.

Seven very helpful appendixes provide a summary of CP/M commands, ASCII character codes, comparison of three CP/M versions, CP/M prompts, diskette selection (which systems use which disks), annotated bibliography (10 pages), and a CP/M Address Book that lists sources of CP/M-compatible languages, programs, and computers.

The chapter on transient commands shows how to expand the basic set of commands by adding programs that act like commands. The chapter on assembly-language utilities, which has "limited applications for end-users who primarily use packaged programs," tells how to develop and modify programs with ASM, DDT and LOAD, and assumes an understanding of assembly-language programming.

Another valuable chapter, on Other Transient Programs and CP/M, looks at four types of programs to be used with CP/M: utilities (format, copy, SYSGEN, etc.) high-level languages (from Basic to PL/I-80), application programs, and word processors.

This is one of the very best CP/M manuals available.

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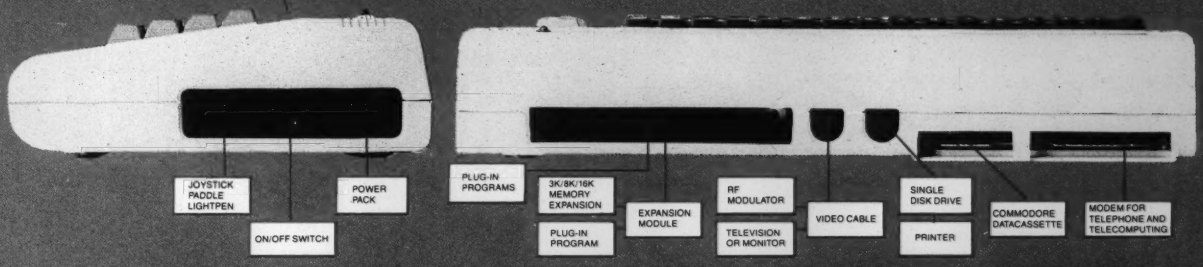

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Number of Keys	66	57	40	53
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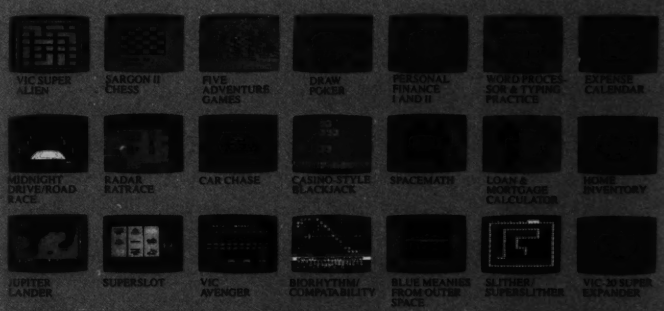
Graphic Symbols On Keyboard	62	0	0	0
Displayable Characters	512	256	64	256
Microprocessor	6502	6502	TI990	6809
Accessible Machine Language	YES	YES	NO	YES
Upper/Lower Case Characters	YES	YES	NO	NO
Operates with all Peripherals (Disk, Printer and Modem)	YES	NO	YES	YES
Full Screen Editor	YES	YES	NO	NO
Microsoft Basic	Standard	N/A	N/A	$ 99.00
Telephone Modem	$109.95	$399.95	$450.00	$154.95

*Manufacturer's suggested retail price Jan. 1, 1983. Includes BASIC cartridge required for programming.



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